American
Gas Journal
THE MAGAZINE OF GAS DISTRIBUTION
SEPTEMBER 1959

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Big—10,000 cfh capacity*

Husky—100 psi working pressure

Light Weight—only 310 lbs.

Compact—40" high x 26⅜" wide

(**Capacity rated at 2" diff. of 0.60 sp. gr. gas*)

The new Rockwell "10,000" answers your needs for a strong, safe, 100 psi working pressure aluminum meter to handle large volume loads. This meter weighs only 310 lb—approximately one-third the weight of comparable cast iron meters of the same capacity. It has been thoroughly field tested under extreme load conditions.

The sturdy aluminum outer case offers high resistance to impact and weathering. Single joint construction with an O-ring gasket reduces the possibility of leaks and simplifies access to the inner mechanism which is removable and interchangeable as a unit. For additional information, write Rockwell Manufacturing Company, Pittsburgh 8, Pa.

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CENTENNIAL YEAR

American Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

Volume 186 September 1959 Number 10

PILOT.. ..LIGHTS

THE
AMERICAN GAS-LIGHT JOURNAL.
JOHN B. MURRAY & CO., BANKERS, NO. 40 WALL STREET, NEW YORK CITY.
NEW YORK, FRIDAY, JULY 1, 1859

Diary Of An Industry

A real treat is in store for AGJ readers next month. October's AGJ will be devoted to a very special feature, *"Diary Of An Industry,"* which will cover 100 years of gas industry happenings — the dramatic and the humorous, the commonplace and the unusual — as reported in the pages of our favorite publication. Tracing the transition of the industry through the decades, our colorful "Diary" will highlight the growth of gas from its early days, when it existed mainly to provide street lighting, to its prominent position today as the nation's fifth largest industry and a prime supplier of the nation's energy. *Added attraction in the October issue will be a reprint of the very first issue — July 1, 1859 — of* AMERICAN GAS LIGHT JOURNAL ... a supplement you'll want to read and retain through the next 100 years.

*

Can't Happen Here?

Municipally-owned gas distribution systems have more than doubled in numbers in the past 15 years. Nearly half of the nation's 1200 "gas utilities" are government-owned — at last count there were 566 municipal gas systems — and their number continues to grow each year. It's a dangerous trend — one that, left unchecked, might ultimately lead the gas industry down the politico's primrose path to complete government ownership. In this month's *Roundtable* feature you'll find the highlights of a recent A.G.A. report on the problem. Don't read it and weep ... read it, instead, and resolve to do your part in "hard selling" the philosophy of **business-managed, tax-paying, investor-owned gas companies.** The time is now; tomorrow may be too late!

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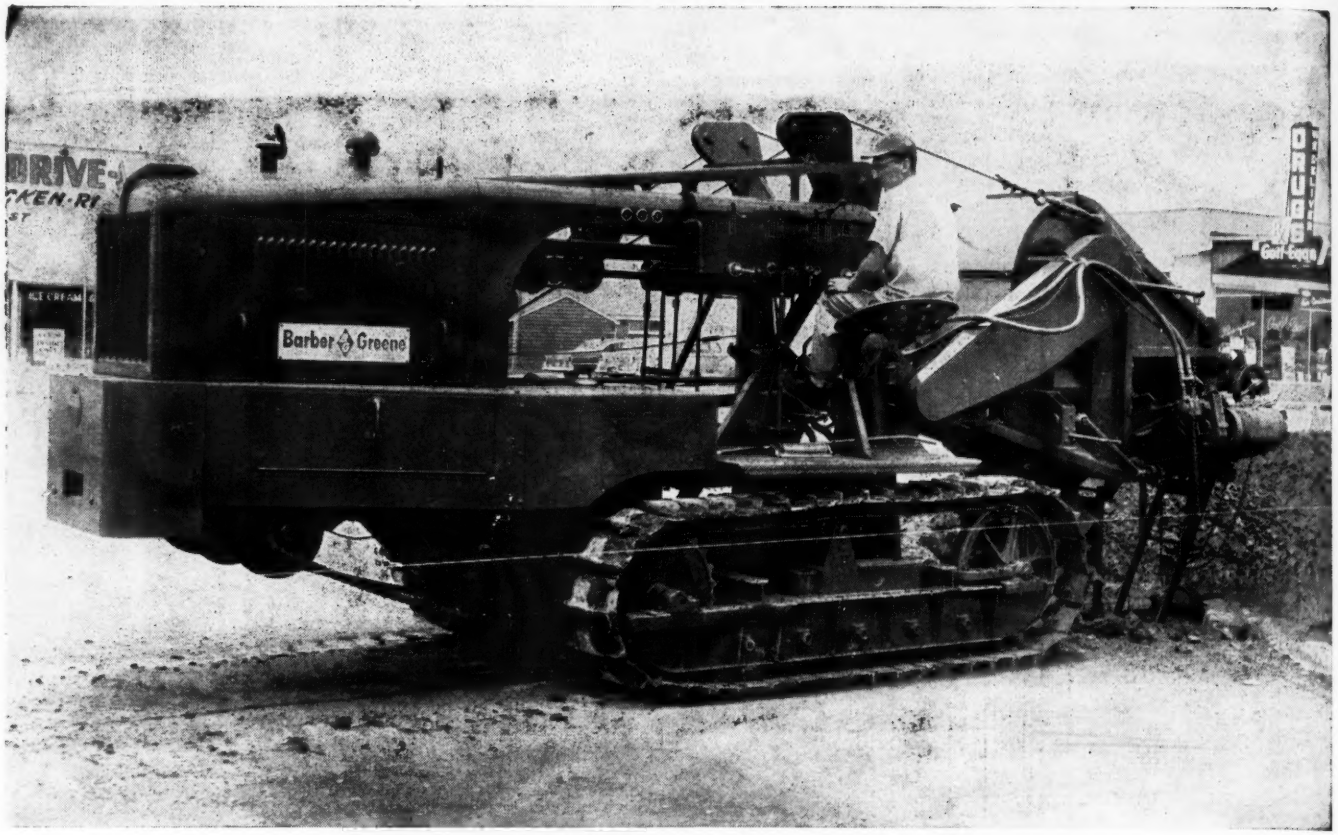

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- New hydraulic spoil conveyor with instant, finger-tip control.

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M C F

NEWS HILITES OF THE INDUSTRY

Green light ringed with "stop" signs. Transwestern Pipeline Company received FPC authorization on August 10 to build its proposed $190,000,000 gas transmission line from West Texas — New Mexico to California — with lots of "ifs" attached to the certificate. Biggest "ifs" are: (1) *Suppliers of 85 percent of the gas for Transwestern would have to reduce prices* — ranging from 1¢ to 6¢ less per Mcf; (2) *Producers would have to sign waivers of their right* (under the Natural Gas Act) to file for higher rates, and, in absence of prior FPC action, collect the increase subject to refund until the commission could determine a just and reasonable rate. The latter condition has no precedent in the history of the Natural Gas Act. It is doubtful that FPC could require such a waiver as a condition for entering upon a new service. More hearings seem inevitable; court action may be necessary. While the wrangling continues, Transwestern's project will lie dormant.

Obsolete. Any rulers, yardsticks, tape measures, or scales you may be using are strictly out-of-date . . . and have been since July 1, 1959! That's the date that the National Bureau of Standards ordered new "standard" measurements into effect. Inches, it seems, are now shorter and pounds weigh more (but don't put away your diet). The new inch is only 25.4000000 millimeters long; it used to be 25.4000508 millimeters. The new pound is the equivalent of .4535924277 kilogram; formerly, it weighed in at a measly .45259237 kilogram. The new standards have been adopted by all English speaking nations. *Keep your old ruler if you wish, but you'll be one of those "sloppy" people who's a millionth of an inch off on everything!*

Energy Under Investigation. Plans for a "broad" study of the nation's energy resources and technology are being laid by the subcommittee on energy resources of the Congressional Joint Economic Committee, and are expected to culminate in public hearings this autumn. While no details are yet available, Congressional sources have indicated that the subcommittee will focus its attention on the availability of natural resources and technology relating to them. *The study, oddly enough, coincides with recent proposals from the coal industry for an "examination" of the national energy picture with the suggestion that a "national energy policy" be formed.*

Possible legislative relief by Congress that "would provide a solution to the worsening problem of federal regulation of natural gas producers" will be studied by a special nine-man committee of the Independent Petroleum Association of America. The group, to be headed by F. Allen Calvert, Jr., Tulsa, president of Calvert Drilling, Inc., will study types of legislative action that not only will correct present confusion but also will be workable and acceptable to the industry, the government, and the consumer.

"Cost of service" method for establishing prices to be charged for gas in the field by independent producers, advocated by FPC examiner Joseph Zwerdling in his decision last April on the three-year-old Phillips Petroleum Company case, won't work, says Phillips, which has filed a 110-page list of exceptions to the examiner's decision. Oral argument on the exceptions is slated for October 1 in Washington. Zwerdling's decision recommended that Phillips be allowed an annual increase in annual revenues of about $14,000,000 — or $35,000,000 less than the company claimed. Phillips, in its list of exceptions, pointed out, among other things, that: (1) At the outset of the hearings it was confronted with a very unfair cost-of-service study by the FPC staff; (2) after three years (and with no end in sight) the "cost-of-service" approach hasn't produced results acceptable to anyone; (3) the examiner's decision attempts to "freeze" prices without regard for constantly and sharply increasing exploration and development costs.

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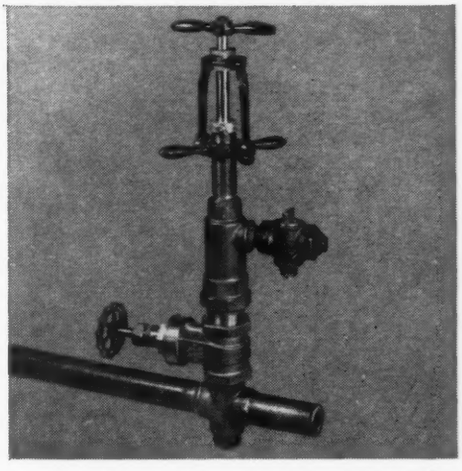
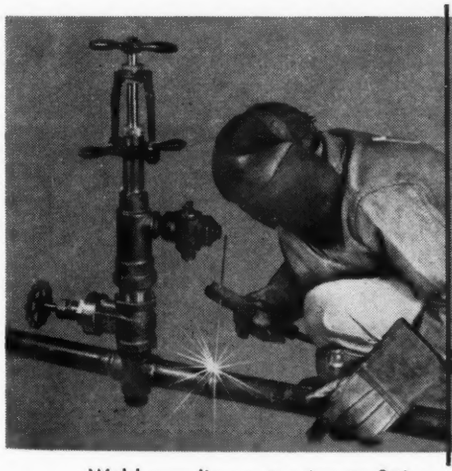
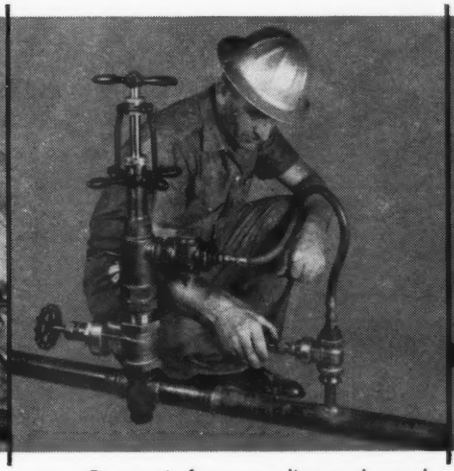
1 Uncover Mueller H-17151 Extension Stopper Fitting which was installed as dead end cap when original line was laid.



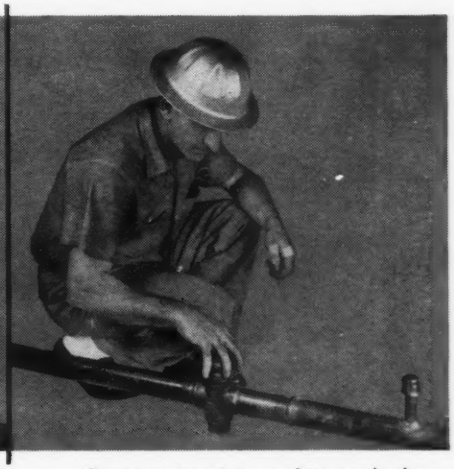
2 Stop-off line at fitting with Mueller Stopping Machine and cut off capped end of fitting.



3 Weld new line extension to fitting and weld Mueller H-17490 Save-A-Valve Drilling Nipple to new line.



4 Purge air from new line and equalize pressure by running hose from by-pass connection of stopping machine to drilling nipple.



5 Remove stopping machine and other equipment and plug and cap extension stopper fitting and drilling nipple.

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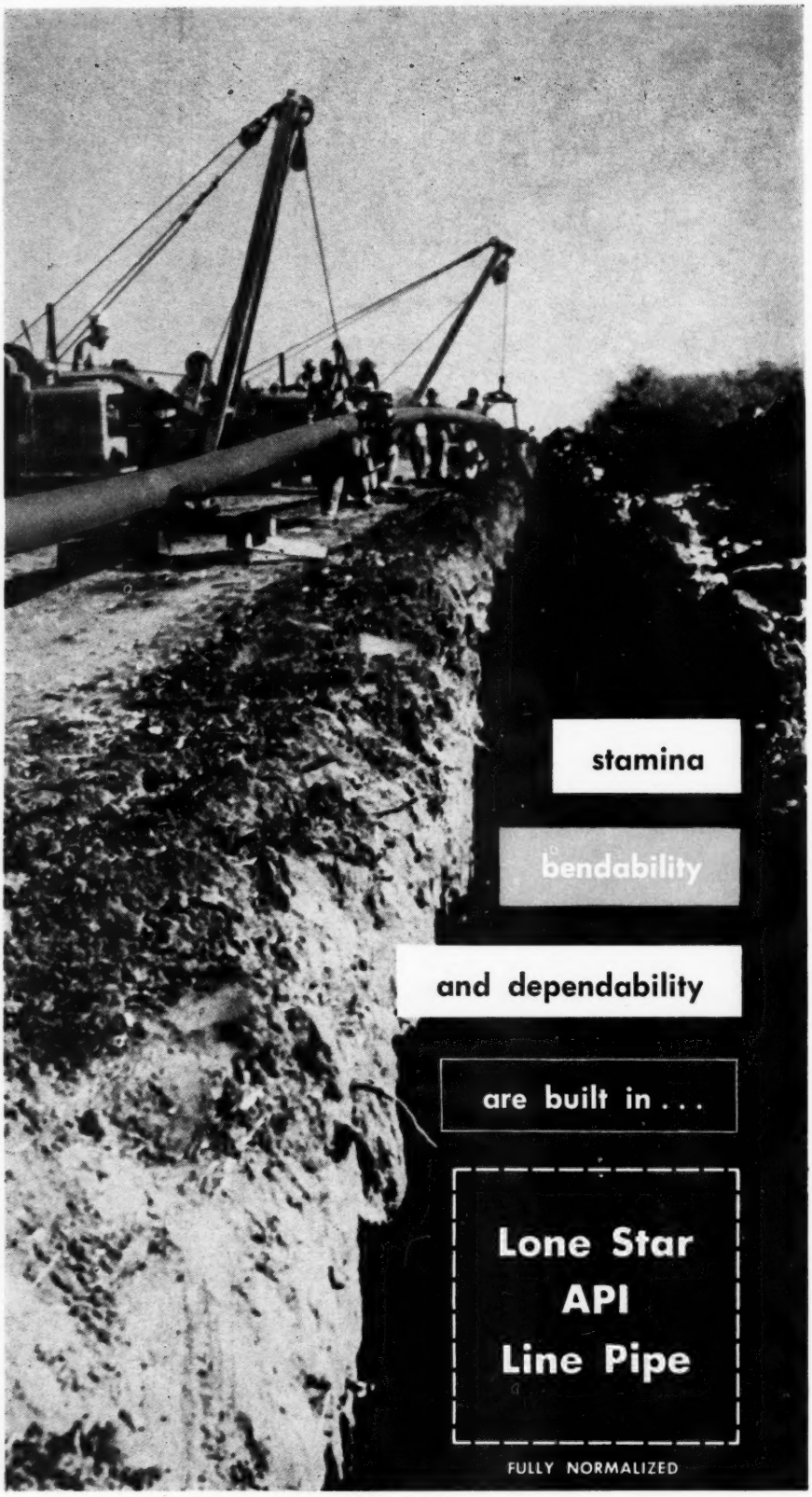

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COMING EVENTS IN THE GAS DISTRIBUTION INDUSTRY

September

9-11 Pacific Coast Gas Association, annual meeting, Hotel Ambassador, Los Angeles, California.

11 New Jersey Gas Association, annual convention, Essex and Sussex Hotel, Spring Lake, New Jersey.

11-12 The Maryland Utilities Association, Virginia Beach, Virginia.

14-15 NEGA, gas utility managers conference, Wianno Club, Osterville, Massachusetts.

14-18 A.G.A. industrial gas school, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania.

15 A.G.A. Paper Industry Heating and Drying Symposium, Manchester Hotel, Middletown, Ohio.

15-16 A.G.A. 11th annual accident prevention conference, The Dinkler Plaza Hotel, Atlanta, Georgia.

17 NGAA rocky mountain regional, Gladstone Hotel, Casper, Wyoming.

17-18 A.G.A. Great Lakes public relations workshop, Dearborn Inn, Dearborn, Michigan.

17-19 Public Utilities Association of the Virginias, 41st annual meeting, The Greenbrier, White Sulphur Springs, West Virginia.

18 Oklahoma Utilities Association, gas division, Biltmore Hotel, Oklahoma City, Oklahoma.

20-23 ASME Petroleum Mechanical Engineering Conference, Rice Hotel, Houston, Texas.

22-23 A.G.A. operating section organization meeting, Hotel Roosevelt, New York, New York.

23-25 Southeastern Gas Association, annual meeting, Hotel Wade Hampton, Columbia, South Carolina.

24 NEGA safety conference, Statler Hilton, Boston, Massachusetts.

28-29 A.G.A. Textile Symposium, Sedgefield Inn, Greensboro, North Carolina.

28-Oct. 1 American Welding Society fall meeting, Sheraton-Cadillac Hotel, Detroit, Michigan.

October

5- 7 A.G.A. annual convention, Conrad Hilton Hotel, Chicago, Illinois.

13-14 Seventh Annual Gas Measurement Institute, National Guard Armory, Liberal, Kansas.

14-16 Wisconsin Utilities Association, operating and sales convention, Shroeder Hotel, Milwaukee, Wisconsin.

16 NGAA, southern regional, Carlton Hotel, Tyler, Texas.

21 NEGA operating division, Statler Hilton, Hartford, Connecticut.

22 NEGA accounting division, Statler Hilton, Hartford. Connecticut.

26-27 INGAA, annual meeting, Westward Ho, Phoenix, Arizona.

28-29 Computer Applications Symposium, sponsored by Armour Research Foundation, Morrison Hotel, Chicago, Illinois.

30-Nov. 1 American Society of Heating, Refrigerating & Air Conditioning Engineers, semi-annual meeting, Traymore Hotel, Atlantic City, New Jersey.

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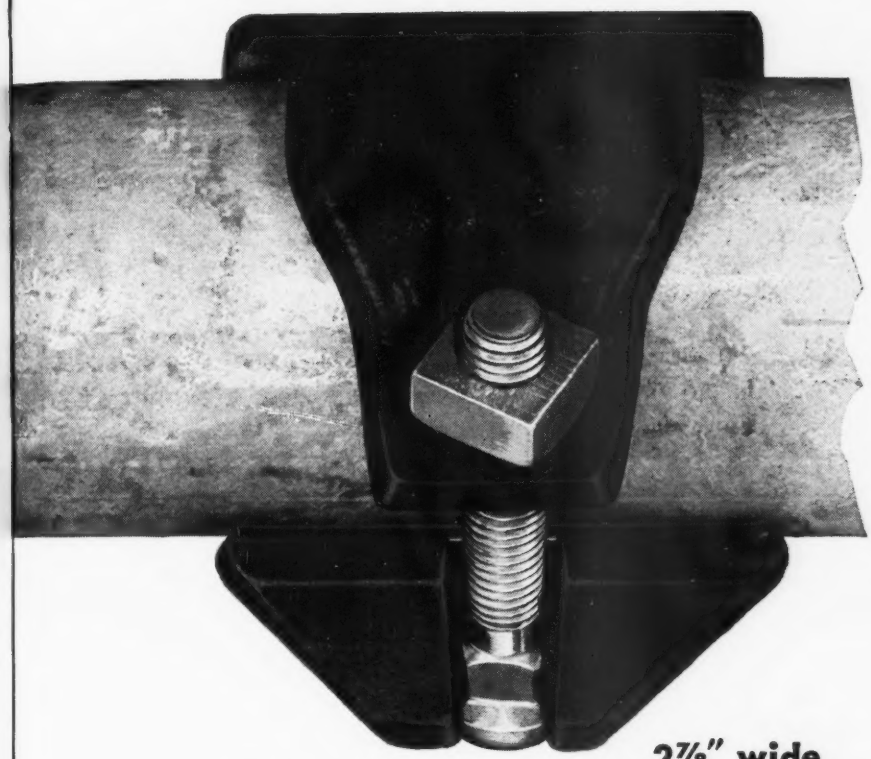

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Made of malleable iron, ruggedly proportioned, with full length hinge along one side. Formed to exact pipe size—no bending. Speediest application—slotted lug permits single oversized plated bolt to slide instantly into place. The recessed pressure-equalizing gasket, entire width of clamp, is cemented in. A lasting installation.

Lug on gasket half is slotted

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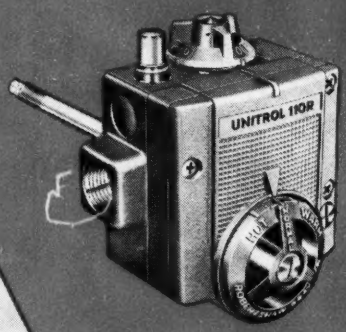

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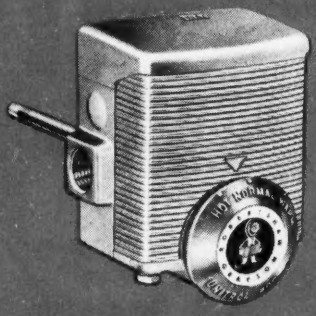

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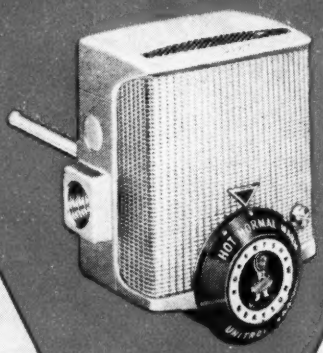

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FOR MORE INFORMATION, CONTACT:

Robertshaw

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MEN AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

● **W. M. Little** has been appointed vice president and manager of operations for North Carolina Natural Gas Corporation. He was formerly project engineer for R. A. Ransom Company, Inc. in the construction of N. C. Natural's recently completed cross-state gas pipeline system.

W. M. Little

J. I. Trimble

● **John I. Trimble** has been named to the newly-created position of general manager of the Janitrol Heating and Air Conditioning Division of Surface Combustion Corporation.

● **M. L. Clough** has joined the management consulting staff of Ebasco Services Incorporated. Prior to joining Ebasco, he was senior staff consultant to SIMCA, second largest automobile producer in France.

● **Elmer W. Cone** has been appointed sales agent in Kansas and western Missouri, for the new Kirk gas refrigerators recently introduced by Kirk Industries.

● **James P. Haas** has been appointed manager of research and development for the metal products division of Koppers Company, Inc. Previously he was manager of the technical department of the division.

● **B. D. Coyle** has been appointed sales representative of Midwestern Pipe Line Products Company in the home office of the Tulsa firm.

● **J. R. "Ren" Carey** has been appointed to the newly-created position of sales manager of refrigeration products of Norge Division of Borg-Warner Corporation. He will direct national sales of Norge home freezers and refrigerators from offices at Norge headquarters in Chicago.

● **Thomas H. Jeffers** has been appointed director of facilities and tooling, West Coast operations for Robertshaw-Fulton Controls Company. Succeeding him as general manager of the Western Research Center in Anaheim, California, is **D. Rex Scott** who had been named assistant general manager of the center earlier this year.

● **William P. Lennon,** executive vice president of Republic Appliance Corporation and general manager of its Erie, Pennsylvania, plant, has been elected president of the water-heater manufacturing company. Other executive changes include: appointment of **Fred Fowler** to executive vice president and director; **Oscar Shabot** to vice president and director; and **Gordon Copeland** to vice president and director.

● **Richard L. Lattimer** has joined the Rohr Advertising Agency as special assistant to the president. He was formerly promotion manager of the Indiana Memorial Union at Bloomington.

● **Thomas F. Haskins** has been named senior buyer of Rockwell Manufacturing Company's general purchasing department. He was formerly supervisor of the accounts payable department.

● White-Rodgers Company has appointed **Edward A. Fehlbaum** as manager of European operations for its line of heating, air conditioning, and refrigeration controls. His headquarters will be in Basel, Switzerland.

● **Herbert H. Hodgeman,** a Texas registered professional engineer, has joined Daniel Orifice Fitting Company of Houston and Los Angeles as valve design engineer.

● **Edgar A. Jahn,** assistant utilization engineer with the American Gas Association for the past 12 years, has been appointed assistant director of A.G.A.'s Utilization Bureau.

● **John A. MacDonald** has been appointed assistant controller of the A.G.A. Laboratories under the direct supervision of **E. L. Bangert,** controller. MacDonald's work will cover the entire scope of the Laboratories' accounting activities.

● **Bohdan Kazymyra,** former member of the federal Department of Agriculture's library staff in Ottawa, has been appointed librarian-archivist for the Saskatchewan Power Corporation.

● **Newton D. Baker,** director of employee and public relations for Black, Sivalls & Bryson, Inc., has been elected to the newly created post of marketing vice president.

● **G. C. Kimbrough** has been assigned as field service engineer in A. M. Byers Company's Atlanta division office. Prior to joining Byers, he was associated with The Pure Oil Company as a lubrication sales engineer and with Sinclair Refining Company as a test engineer.

● Cribben & Sexton Company has appointed **A. A. Barnhart** manager of its eastern division, with headquarters in Newark, New Jersey, succeeding **Fred F. Lauer,** who recently resigned.

● Clark Bros. Co., one of the Dresser Industries, has announced the following new sales appointments: **Ernest G. Hotze** has been appointed southwest district manager; **Joe Y. Allen, Jr.,** former assistant district manager, succeeds Hotze as Houston district manager; **James R. Hutton,** also named district manager under Hotze's supervision, will be in charge of the newly created Louisiana-Mississippi district.

● **Thomas W. Jones,** supervisor of the Beloit division of The Gas Service Company, has been promoted to superintendent of that division. **Thomas A. "Tom" Robinett,** member of the engineering department at general office has been promoted to office engineer, succeeding **V. Maximoff** who retired recently.

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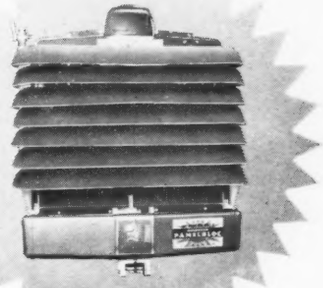

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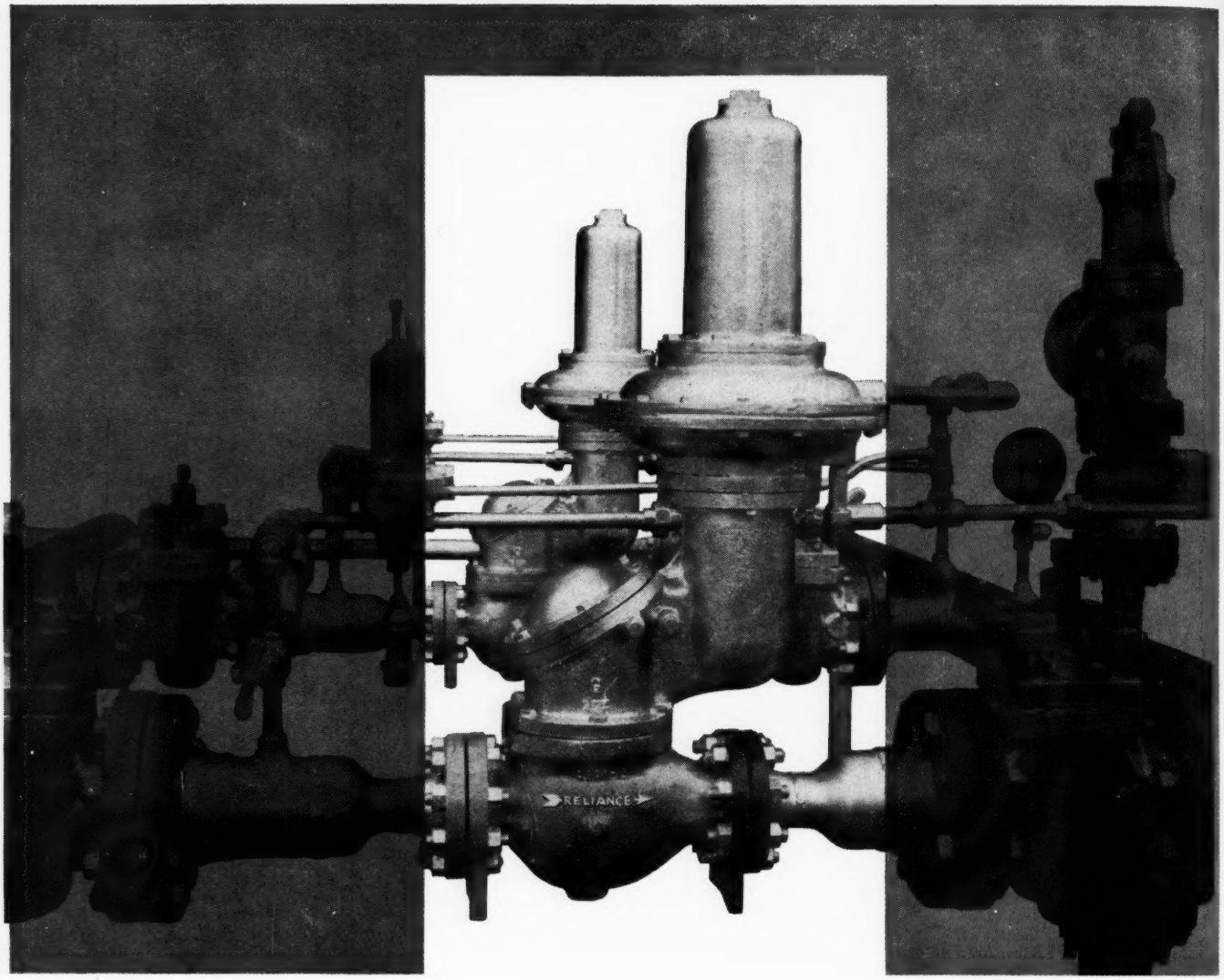

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Men at Work

● **Edward E. Stevenson** has been promoted to the general sales manager staff of Peoples Natural Gas Company of Pittsburgh. He is succeeded as supervisor of sales and service for the Pittsburgh division by **John R. Riley** who formerly assisted in advertising and sales promotion work. Riley will headquarter in Wilkinsburg.

● **E. J. Durnin,** director of planning and administration controls, has been appointed to the management advisory committee of Saskatchewan Power Corporation.

● Southern Counties Gas Company has announced a series of promotions in their general office sales department staff: **W. J. Altpeter,** who has been serving as staff representative, appliance merchandising, has been named to the new post of staff representative, builder promotion. **E. G. "Gam" Croom,** who has been serving as coordinator, new construction promotion, has been promoted to the job of staff representative, appliance merchandising. **H. E. Woodworth,** who has been serving in the utility's Harbor division sales department, has been transferred to the downtown general office sales staff as coordinator, new construction promotion.

● **James H. Satterwhite,** president of American Meter's Westcott & Greis division since 1950, is retiring from the company. He joined Westcott & Greis, Inc. in 1917 as general manager and continued in that capacity after American Meter acquired the company in 1932.

● **C. K. Ferguson,** has been named manager advertising and sales promotion, for American-Standard Industrial Division, Detroit producer of heating, air conditioning, air handling, heat transfer, and fluid drive equipment.

● Two former executives of H. H. Buggie, Inc., Toledo, until its acquisition in May by Burndy Corporation, Norwalk, have been named to posts with the latter company. **John F. Jones,** former president and director of Buggie, has been elected a vice president and director of Burndy; **George A. Goos,** vice president and director of Buggie, has become assistant secretary of the latter company.

● **Gerald L. Jensen** has been appointed field service engineer for Pacific Northwest by A. M. Byers Company of Pittsburgh.

● Clark Bros. Company has appointed **Z. B. Deer, Jr.** sales engineer in the Texas-Oklahoma Panhandle area.

● **Andrew L. Bavas** has been named assistant advertising manager of Cribben and Sexton Company of Chicago, a subsidiary of Waste King Corporation.

● **J. Edward Ashworth** has joined Commonwealth Services, Inc. as general consultant in the Houston, Texas, office. He was formerly Dayton, Ohio, representative of AVCO Manufacturing Corporation, handling engineering liaison and contract administration for the Lycoming division and research and advanced development division.

● **B. B. Williams,** honorary chairman of the board, and chairman of the executive committee of The Cooper-Bessemer Corporation, has retired after 58 years of continuous service to the company.

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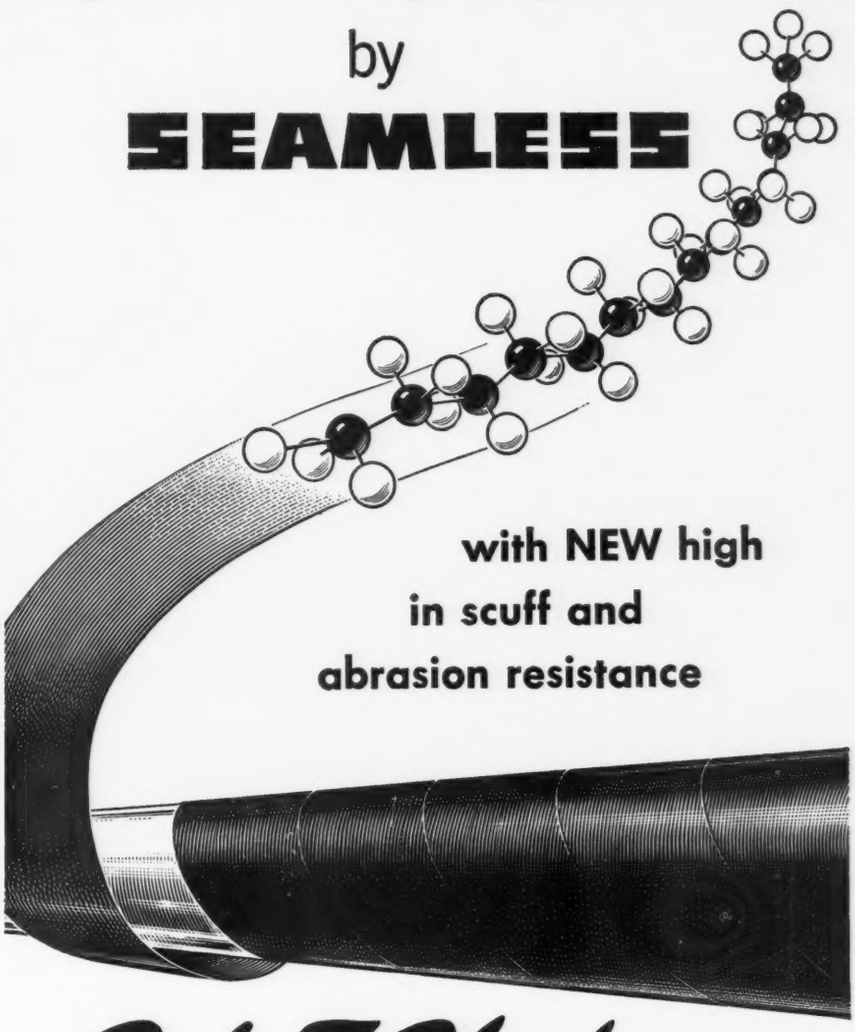

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Men at Work

● **John A. "Lon" Sheahan,** residential heating and air conditioning consultant with the commercial department of Atlanta Gas Light Company, retired July 1 after nearly 30 years service with the company.

● **Burton F. Wiand** has been elected vice president in charge of the public and industrial relations division of Cities Service Gas Company. He was formerly manager of the division.

● **John K. Tolford,** executive vice president and general manager of the Citizens Gas Fuel Company of Adrian, Michigan, has been promoted to president of the company. **E. V. Gmeiner,** president of the company since 1939, has resigned but will continue with the company as a consultant, director, and member of the executive committee. **Robert Nystrom,** distribution superintendent, has been promoted to general superintendent.

● Recent personnel changes at Connecticut Light and Power Company include the appointment of **H. Read Shailer, Jr.,** formerly industrial sales engineer at Waterbury, to division sales engineer for the northern division, succeeding the late James M. Blackford. **Traver L. Berry** has been elected controller succeeding the late Leo A. Mayo. Berry was formerly assistant controller. **W. Lindsey Booth,** manager at East Hampton, has been named executive assistant to **Robert P. Stacy,** vice president in charge of administration. **C. Marvin Curtis,** manager at Glastonbury, has been named to fill the East Hampton post, and **Frederick W. Riggs,** industrial sales engineer at Essex, has been made manager at Glastonbury.

● **Herbert D. Clay** has been elected president of Iroquois Gas Corporation to succeed **Stuart H. Nichols,** who was recently elected president of the National Fuel Gas Company. **Louis R. Reif,** vice president, has been elected a director of the company.

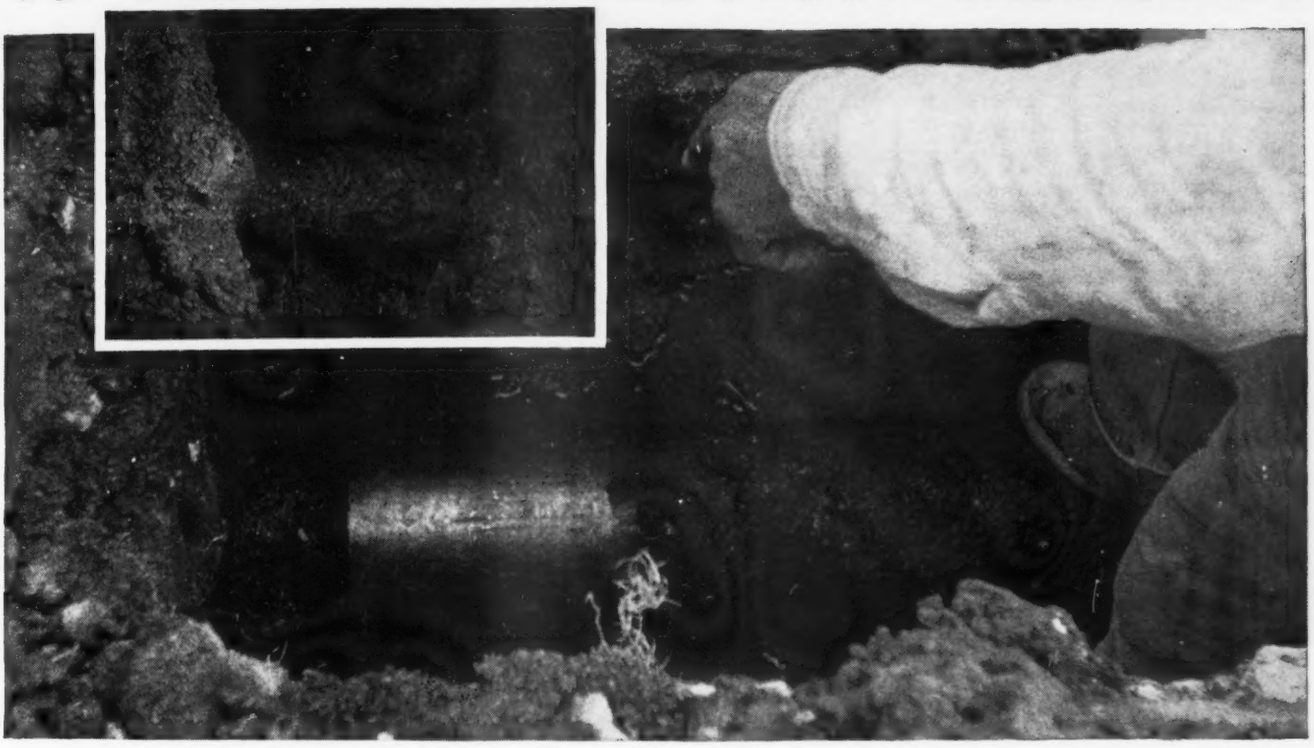
● **Eben Wright Pyne,** president of the First National City Trust Company, has been elected a director of Long Island Lighting Company to succeed **Lee P. Stack,** a director of LILCO since 1951, who recently resigned.

● **George C. Brooks,** who rose from meter reader to manager of employee relations of New York State Electric and Gas Company, retired June 1 after more than 41 years of service with the company. He is succeeded by **Frank R. Doughty,** his assistant.

● Recent personnel changes at Ohio Fuel Gas Company include the transfer of **Willard C. Schwartz** from Fremont to Parma as division accounting supervisor; promotion of **James R. (Dick) Galloway,** former fitter-in-charge in St. Clairsville, to construction crew foreman in O-F's Toledo district; and promotion of **Marvin E. White,** Athens district industrial sales manager, to industrial sales manager of the company's Columbus district. **Harold R. Rohr** of Fremont succeeds White in Athens.

● **James W. Williams** has been promoted to Muskogee district operating superintendent of the Oklahoma Natural Gas Company succeeding **W. G. Van Arsdale,** who retired in May after nearly 38 years with Oklahoma Natural.

17-YEAR PROTECTION RECORD!



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Since this cost-cutting coal tar coating in tape form was first introduced in 1941, it has demonstrated its ability to withstand severe conditions underground or under water. TAPECOATED lines dug up after 17 years of service show no signs of deterioration on the pipe.

Typical is the experience of a utility in a coastal area. For a thorough trial, this company applied TAPECOAT in areas where severe corrosive conditions were known to exist. The lines were dug up this year and, after years of service under severe conditions such as brackish waters and corrosive soil, the pipe showed no signs of corrosion, proving the quality of TAPECOAT protection.

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BOOKSHELF

Gas Turbine Progress Report, *published by the American Society of Mechanical Engineers, 29 West 39th Street, New York 18, New York. Pages, 141. Price, $5.*

Progress in the use of gas turbines for prime movers is reviewed in 12 areas including developments of gas turbine materials, advances in turbine cooling, fuels and the technical problems associated with them. Cycle components and the trend toward simplicity in their arrangement, compound piston-and turbine engines, gas turbines in rockets, automotive and locomotive fields, the gas turbine and free-piston gas turbine in the marine field, and industrial and central station applications of the gas turbine are also discussed.

Industrial Leadership, *by Clarence A. Weber and John W. Karnes, Jr., published by Chilton Company, Book Division, 56th and Chestnut Streets, Philadelphia 39, Pennsylvania. Pages, 226. Price, $5.*

One of the most pressing problems facing industry and business today is that of "upgrading" men and women to assume positions of leadership. Such a process of "upgrading" involves training and educating such persons to become better supervisors, better foremen, better junior executives, and better service agents for the organization. As President Eisenhower is quoted, "Failure to accept the responsibilities inherent in a free economy could lead to demands that they be assumed by government." As a result, the authors have concluded that management is greatly concerned with "upgrading" employees to assume positions of leadership in such a way as to guarantee perpetuation of free economy and democratic control. Authors discuss the challenge of leadership, the need for leaders and the risks they must take, and the effects many situations have upon them. Questions are provided at the end of each chapter for group discussion use.

How To Buy Government Surplus, *by Karl Ort, Aviation Surplus Center, York, Pennsylvania. Pages, 48. Price, $1.*

Handbook shows surplus bargain hunters how to bid and buy from the U. S. Government. The kinds of surplus available to buyers, what makes them available, how you can buy government surplus, how to get your name on the bidders' list, how various types of surplus sales are conducted, grades of surplus, what to do with your purchase, how to submit bids, and how to pay for the surplus you buy are discussed. New directory gives names of disposal officers, telephone numbers, and locations where various types of government surplus is offered. Maps show location of major depots; a special section indicates where jeeps, fork lifts, trucks, and amphibious vehicles can be purchased.

Standard Practices for Stationary Diesel and Gas Engines, *5th edition, published by Diesel Engine Manufacturers Association, 2000 K Street, N.W., Washington 6, D. C. Pages, 220. Price, $5.*

Significant developments in the engine field including development of high compression gas engines, adaption of diesel engine to burn low grade residual fuels, and new super-charging systems that have made it possible to operate engines at considerably higher elevations with sea level ratings, have been incorporated in new edition. Book is written primarily to aid those who design and operate diesel and gas engine power plants, or those responsible for preparing purchase specifications of these plants. Includes 20 chapters on definitions, performance and equipment, engine construction, gaseous fuels, selection of engine sizes, and operation and maintenance.

THE PRESIDENT'S GUIDE, *published by Prentice-Hall, Inc., Englewood Cliffs, New Jersey. Pages, 1200. Price, $35.*

New guide gives company president, in a single volume, help on 7 critical matters he must handle to be successful today. The areas covered and the help it gives on each include: *How To Get More Work From Your Employees* with new management discoveries to cut down employee turnover, and new method for cutting training time. *How the Top Man or Owner Can Get More Money From the Company; How to Raise Cash for Your Company* through long-term and short-term borrowing. *How Company Head Can Slash His Personal Tax Bill* by dividing income among the family, or converting ordinary income into long-term capital gain where tax is only half as much or less. *How to Boost Profits by Cutting Costs* through employee cooperation, reduction of overtime, use of certain accounting methods to cut costs; and eliminating space-eating business records that most companies keep much longer than they must. *How to Develop New Products and Markets . . .* quick rundown of big new markets in America today; trends in products and ideas, materials, and design. And *How to Handle the Hot Questions of Corporate Procedures.*

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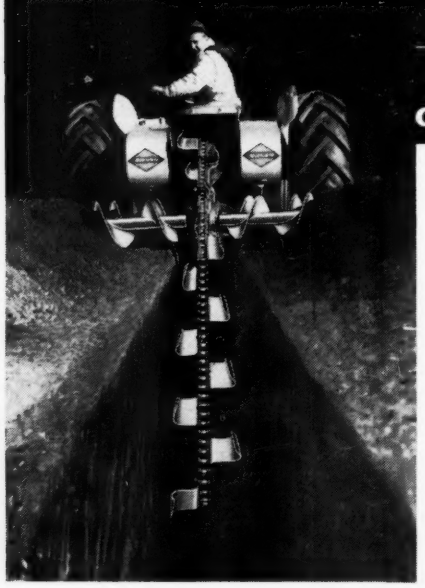

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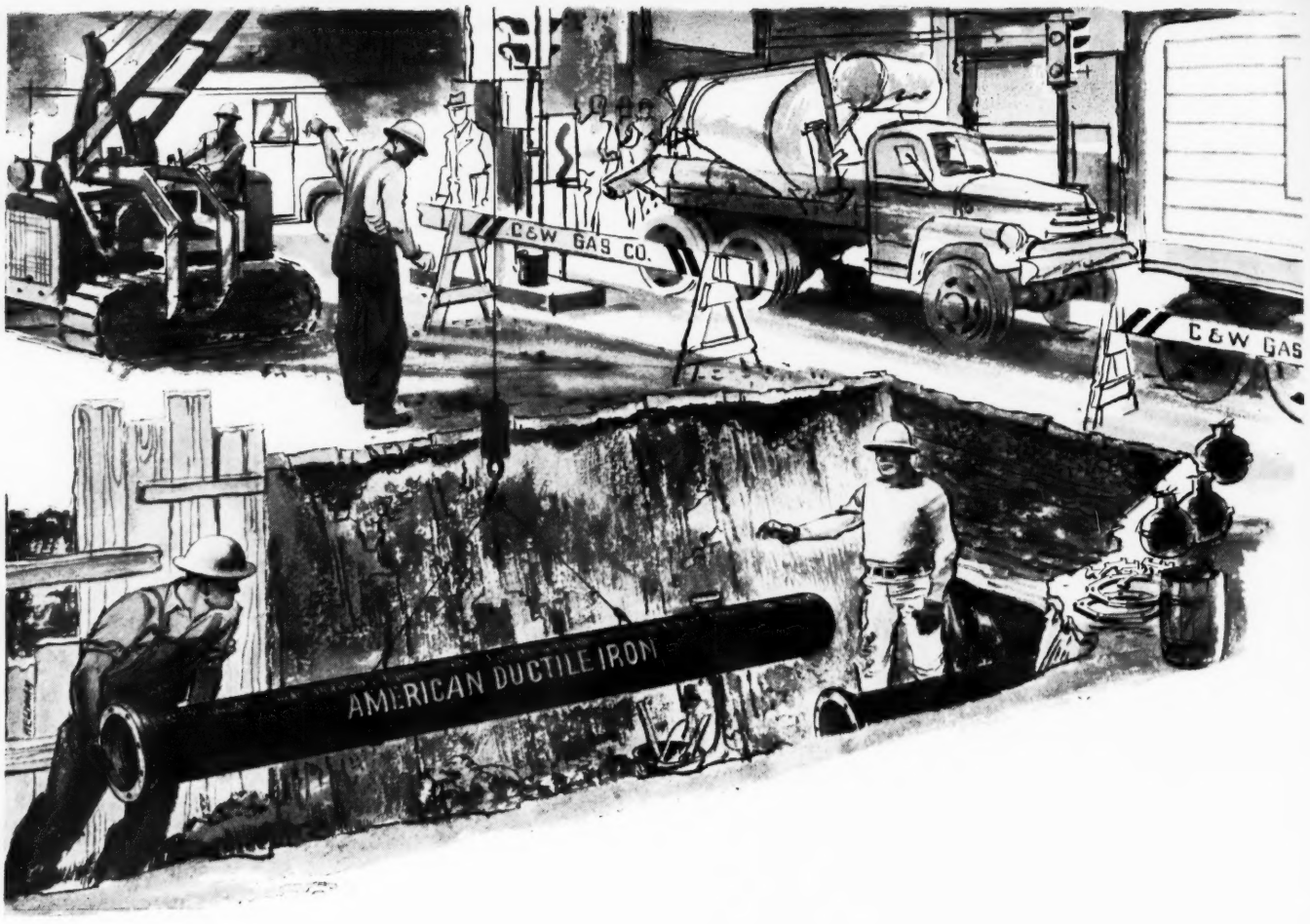

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Statistics in New A.G.A. Report Show Dangerous Trend Still Forging Ahead . . .

ROUND TABLE

Monthly Forum on Fuel for Thought

Municipal Ownership Hits New High

MUNICIPALLY-OWNED GAS UTILITIES IN THE U. S. continued to increase in the 12-month period ending July 1, 1959; as of that date, 566 government-owned gas distribution systems were in operation, serving more than 2,100,000 customers — approximately 7 percent of all gas industry customers.

Government ownership, reports American Gas Association in an annual summary, continued to inch ahead on a national basis. *In the Southeast, it proceeded at a gallop.* Number of states with municipal gas operations remained the same at 34; increases were reported in 13 states, compared to 18 a year ago, and two states reported declines of one each in number of municipal systems operated.

Significantly, notes A.G.A., percentage gains of municipal utilities in numbers, sales, and customers were ahead of industry figures as a whole. Comparisons are given in Table 1.

Government ownership remained strongest in the Southern states — both in actuality and in threat of increased municipal ownership. Most of the activity occurred in the southeastern states, with the addition of municipal gas systems in 25 cities in the states of Alabama and Tennessee. With natural gas being introduced in Florida, municipal ownership advocates have nominated the Peninsular state as their next major target. *(Reports to American Gas Journal indicate that approximately 15 municipal systems are currently planned in Florida.)*

On the credit side of the ledger, no new municipal systems were reported in the New England and Middle Atlantic States and no new states initiated municipal projects. Two states — Virginia and Ohio — reported fewer municipal plants as investor-owned companies acquired former municipal systems.

Greatest concentration of municipal-owned gas systems is now in Alabama (82), followed by Tennessee (62), Louisiana (61), Georgia (58), Texas (46), Illinois (34), Kentucky (31), Mississippi (28), Kansas (20), and South Carolina (11).

Population density is a significant factor in municipal ownership, A.G.A. reports in a new detailed tabulation of such projects by population categories (Table 2). Only 29 cities of more than 25,000 population have municipal systems, yet they account for 72 percent of all municipal customers. The five largest cities account for 71 percent of the customers in these 29 cities.

The remaining 28 percent of the nation's gas customers are served by 537 municipal systems — and these 537 municipal systems, 95 percent of the total, are in communities of less than 25,000 population. Most of these are small communities adjacent to new gas transmission lines.

Such small communities may not be viewed as "profitable" . . . but this constant "chipping away" of new business is a constant threat to business-managed, investor-owned gas companies. Allowed to continue unhampered, it could lead to that feared, although long range, threat of complete government ownership of the gas industry. It can be prevented only by constant, continuing action in selling the superiority of business management in the gas industry. "Public" ownership's appeal is in the "something for nothing" approach, a device long used for political purposes but one that has no economic foundation.

* * *

TABLE 1.

Analysis of Customers, Sales, and Revenues of Municipal Gas Systems with Revenues of $25,000 and Over During 1958.

	Municipal Operations			Industry Totals			% of Industry	
	Dec. 31'58	Dec. 31'57	% Change	Dec. 31'58	Dec. 31'57	% Change	Dec. 31'58	Dec. 31'57
Customers	2,136,600	2,069,900	+ 3.22	31,242,000	30,476,000	+ 2.5	+6.83	+6.79
Sales (M-Therms)	3,592,300	3,251,900	+10.47	80,285,000	77,034,200	+ 4.2	+4.47	+4.22
Revenues ($000)	249,253	219,313	+13.65	4,538,321	4,123,555	+10.5	+5.46	+5.31

TABLE 2.

Analysis of Municipal Gas Systems By Size of City and Number of Customers Served.
(as of July 1, 1959)

Population Group	Number of Cities	Percentage of Total Cities	Number of Customers	Percentage of Total Customers
Over 25,000	29	5	1,566,849	72
10,000 to 25,000	52	9	199,794	9
5,000 to 10,000	84	15	162,392	8
2,500 to 5,000	114	20	126,763	6
Less than 2,500	287	51	115,497	5
	566		2,177,195	

TABLE 3.

Municipal-Owned Gas Systems In the United States.

Number of Systems, As of July 1, 1959, by Regions and States and Changes During Previous 12-Month Period.

Region and State	Total 7-1-59	12-Month Change	Percent Change
United States	566	+57	+11.2%
New England	5	—	—
Connecticut	1	—	—
Massachusetts	4	—	—
Middle Atlantic	4	—	—
New York	2	—	—
Pennsylvania	2	—	—
East North Central	51	+ 9	+21.4%
Illinois	34	+10	+41.6%
Indiana	9	—	—
Michigan	3	—	—
Ohio	5	(—1)	(—16.7%)
West North Central	54	+ 3	+ 5.9%
Iowa	11	—	—
Kansas	20	+ 2	+11.1%
Minnesota	7	—	—
Missouri	7	+ 1	+16.7%
Nebraska	7	—	—
South Dakota	2	—	—
South Atlantic	91	+ 2	+ 2.2%
Florida	12	—	—
Georgia	58	+ 1	+ 1.8%
Maryland	1	—	—
North Carolina	6	—	—
South Carolina	11	+ 2	+22.2%
Virginia	3	(—1)	(—25.0%)
East South Central	203	+36	+17.7%
Alabama	82	+13	+18.9%
Kentucky	31	+ 8	+34.8%
Mississippi	28	+ 3	+12.0%
Tennessee	62	+12	+24.0%
West South Central	134	+ 5	+ 3.7%
Arkansas	6	—	—
Louisiana	61	+ 3	+ 5.2%
Oklahoma	21	—	—
Texas	46	+ 2	+ 4.5%
Mountain	15	+ 1	+ 7.1%
Arizona	5	—	—
Colorado	4	+ 1	+33.3%
Montana	1	—	—
New Mexico	5	—	—
Pacific	9	+ 1	+12.5%
California	5	—	—
Washington	4	+ 1	+33.3%

—Source: American Gas Association.

In San Diego . . .

Systematic Approach Proves Practical For Leakage Mitigation and Replacement

F. G. H. Elliott, *Gas Distribution Department*
San Diego Gas and Electric Company
San Diego, California

Determining when pipe replacement should be made is a problem of long standing. San Diego Gas and Electric Company started a pipe replacement program in the early 1920's based primarily on longevity. A short time after the program was under way, it was found that the pipe had many more years of life expectancy, and that replacement was not required. The longevity projects were discontinued.

It was evident from this experience that a different approach was necessary — for example, some measure such as deterioration in addition to age — for determining pipe replacement. Prior to this time, leakage mitigation was not a specialty. A patrolman walked the area served by the company, looking for gas leaks, but other than that there was no formal leakage investigating program.

During the next several years various methods for locating gas leaks were investigated, such as bar hole surveys, additional patrolmen in the field, vegetation surveys by experts, isolated area pressure drop and meter tests, and manhole and substructure surveys. While, through the use of these plans, numerous leaks were located and repaired, the evidence pointing to pipe replacement was not always conclusive. This was probably due to the method of recording the leakage information.

Ultimately, a controlled system was set up whereby leakage history of any section of the distribution piping could be properly accumulated. The system, through practical working, evolved into the one now in use. Information from this system is factual and readily available for use to determine when replacements are necessary.

This report describes the working system controlling the leakage mitigation and replacement practices now used by the San Diego Gas and Electric Company.

Leak Reports Have Many Sources

Reports of leaks are received from patrolmen, manhole surveys, bar hole surveys, customers and others. Five patrolmen are constantly in the field making what might be called "vegetation surveys" of the approximately 2200 miles of main in the system. They are assigned areas that are patrolled about twice a year. They walk alone and do not carry instruments. Their reports are field checked by two properly equipped, two-man crews for verification and necessary action. Routine manhole surveys that have been in progress since 1929 include all street openings in the business districts and all major street openings throughout the area served by the gas system.

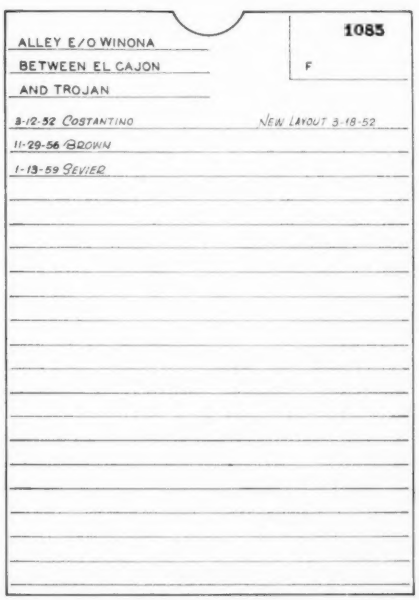


FIG. 1. Typical leak folder is a 6-in. by 8½-in. envelope open at top. Folders are numbered consecutively, are used to hold a leak repair report, sketch, and general order.

Bar Hole Surveys

Bar hole surveys are not a routine procedure. They are used in suspected areas or to gain supplemental evidence in support of a replacement request. Customer reports of gas leaks are usually investigated by customer service personnel, who are equipped with necessary leak detectors. Reports from others — which would include contractors and other utilities — are investigated by four roving two-man crews that travel in radio-equipped cars and are properly prepared to investigate reports of this type (although not their primary job). Five leak crews equipped with radios and necessary equipment are presently available for leak repair work. However, other gas crews repair gas leaks if the occasion arises.

Leakage mitigation work has been carried on at about the same rate for several years. Probably it would have accelerated had the unaccounted for gas percentage figure gone out of line. Inasmuch as it was 8.9 percent in 1930, and has gradually decreased, with few ups and downs, to 1.3 percent in 1958, leakage repair activity has not been increased or decreased.

San Diego G. & E. Co.
Litho 350

LEAK REPAIR REPORT

LOCATION _____

☐ SERVICE ☐ MAIN ☐ STEEL ☐ CAST IRON PIPE SIZE _____ YEAR LAID _____ AGE IN YEARS _____	**SOIL** ☐ ADOBE ☐ LOAM ☐ SAND ☐ GRAVEL ☐ HARD PAN ☐ DECOMPOSED GRANITE	**WRAPPING** ☐ NONE ☐ GOOD ☐ FAIR ☐ LOOSE IN SPOTS ☐ ALL LOOSE ☐ BARE SPOTS
RUST ☐ NO RUST ☐ LIGHT RUST ☐ MEDIUM RUST ☐ HEAVY RUST		**PAVING** ☐ NONE ☐ PAVED
CAST IRON PIPE ☐ NO SOFT SPOTS ☐ 1 OR 2 SOFT SPOTS ☐ LARGE AREAS GRAPH ☐ 2/3 SURFACE GRAPH ☐ ENTIRE SURFACE GRAPH	**STEEL PIPE** ☐ NO PITS ☐ FEW PITS ☐ PITS IN GROUPS ☐ LARGE AREAS PITTED ☐ ENTIRE SURFACE PITTED	**CONDITION OF SOIL** ☐ DRY ☐ DAMP ☐ WET

DEPTH OF PIPE _____
GENERAL CONDITION OF PIPE: GOOD _____ FAIR _____ POOR _____
LEAK CAUSED BY: _____

WORK PERFORMED

COMPLETED _____ BY _____

FIG. 2. Leak repair report form. These forms are 5-in. by 8-in. and fit into the leak folder. Forms are numbered consecutively in the folder for continuity.

GENERAL ORDER (Second Sheet)
SAN DIEGO GAS & ELECTRIC CO.
LITHO NO. 168

LEAKAGE NO _____

FIG. 4. General order form is also a 5-in. by 8-in. size and fits into the leak folder. Forms, used for reports of leaks from servicemen, patrolmen, leak crews, etc., are also numbered consecutively inside the folder for continuity.

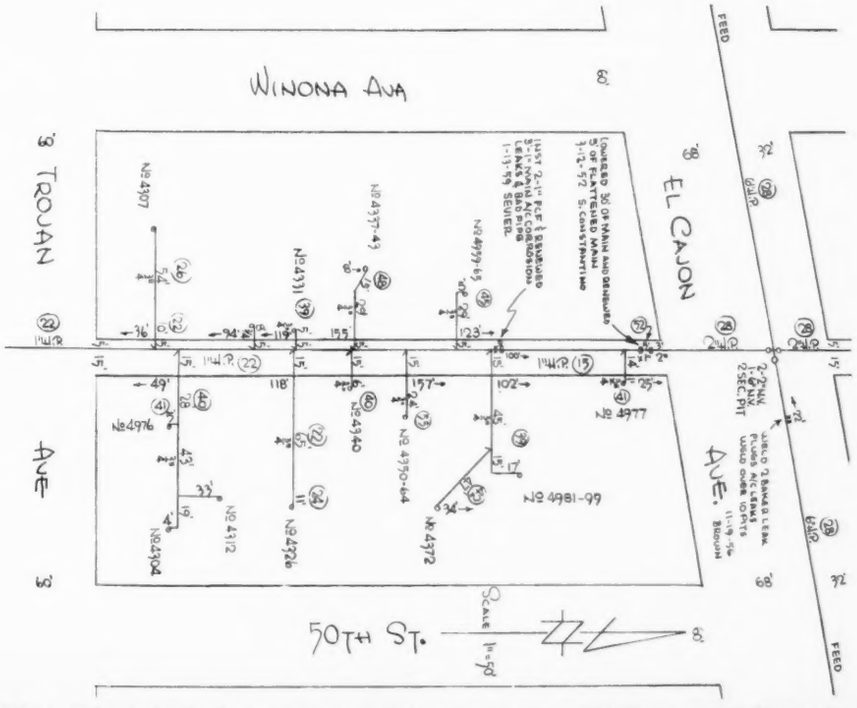


FIG. 3. Typical sketch sheet used in leak folder is made on standard size paper sheet, gives complete picture of pipe section with ages, sizes, tie-in dimensions, etc. Leak repairs are plotted on the layout by leak crew foreman.

Records Vital to Program

Records used and maintained for the system are described as:

1. **Consecutively numbered leak folders.** The leak folder (Fig. 1) is a 6-in. by 8½-in. envelope open at the top end. The face of the folder is divided by lines that provide an area in the upper right hand corner for a folder number and control letter for date book (described later) use; in the upper left hand corner is an area for the location of a section of pipe covered by the folder. Below the heading are spaces for recording the dates when leak repairs are made, followed by the repair foreman's name and for dates when the layout was checked. Inside, each leak folder contain:

a. *Individual "Leak Repair Report"* (Fig. 2). This report is completed by foremen making the leak repair and is most important for replacement decisions. The form, starting at the top, has a heading for showing the location of repair, boxes for checking items

such as whether the pipe is steel or cast iron, main or service, type of soil, condition of wrapping, whether the area is paved, condition of pipe metal (for cast iron the amount of graphization, or for steel, the frequency of pitting), and condition of the soil, whether dry, damp or wet.

An area is provided for recording the depth of the pipe, its general condition, the probable cause of the leak and finally the foreman's report of work performed. Included in the report are comments on customer and general public reaction or anything unusual about the repair. After a series of leaks has been repaired in a specific area, the reports furnish a detailed description of the pipe in question. Forms are consecutively numbered in the leak folder for continuity.

b. *"Layout" or "sketch"* (Fig. 3) of section of pipe. The sketch is a complete picture of the section of pipe showing ages, sizes, tie-in dimensions, etc. Leak repairs with appropriate remarks are plotted on the layout by the leak crew foreman. This layout together with the *"Leak Repair Reports"* gives a complete graphic description of the section of pipe covered by the leak folder. Layouts are furnished and rechecked by the gas engineering department as needed.

c. *"General Order Form"* (Fig. 4). The form is used by gas department personnel receiving reports of leaks, by servicemen making leakage investigations resulting from customers' reports, by patrolmen reporting suspected leaks and by the two-man crew with leak detector making follow up checks of suspected leaks or periodic checks of the leak folders as set-up by the date book. Forms are consecutively numbered for continuity.

2. **Map Book.** The book contains:

a. *General Index Map, County of San Diego.* Map shows cities, towns, roads, highways, etc., and is divided into sub-areas in the territory covered by the gas distribution system. Sub-areas are assigned a control number for ease in locating them in the sub-area index map section.

b. *Sub-Area Index Maps.* On these maps, the leak folder number is also stamped on the block or section covered by the folder. Maps on which the leak folders numbers are plotted have several uses. For instance, when a leak is reported, the map book is consulted to see whether or not a folder covering the area is in the file or when street improvement plans are received, the maps will show whether leaks have been repaired in the improvement area.

3. **Leak Folder Catalog.** The catalog is a loose leaf binder divided into sections:

a. Section One lists all leak folders numerically, and the location of the block or area covered by folder.

b. Section Two shows date, location, and origin of the leak. This information is used for compiling annual reports. Leak origin is important because it is a measure of the effectiveness of the various surveys.

c. Section Three in the catalog provides space for noting when a leak folder is issued and when it was returned, which is an absolute necessity. At present there are between 3900 and 4000 folders in the files; therefore, the whereabouts of each folder must be known or there will soon be confusion.

4. **Date Book.** This book contains all the days of the year for approximately one year ahead. It is used to set up folders for re-check by the two-man crew, with leakage detector described previously. The book divides the gas system into areas identified by letters of the alphabet. The re-checks are set up so that a maximum number are in one area per day for efficiency purposes, i.e., minimum travel time by the crew. The "date book" re-check system keeps the leak folders alive until replacements are made.

5. **Street Opening Survey.** The surveys are made by workmen, as described earlier, and are logged in a series of small ring binders that have a separate page for each city block. On the upper part of the page is a drawing depicting a typical street on which symbols denoting the type and approximate location of the manhole or street opening are stamped. Symbols are consecutively numbered and the test results are recorded opposite the corresponding number on the lower part of the page. This survey is used as a measure for controlling gas leakage in congested areas.

The leak folder is the *"life history"* of a section of gas pipe. It is similar to a vehicle maintenance record. When a vehicle is worn out economically, it is discarded. The same holds true for the pipe. When it no longer can serve the company economically, it is replaced. The leak folders are kept in standard drawer files and divided into an **active section** and an **inactive section.**

The active group is kept separate merely to denote attention. The files are kept under surveillance by individuals trained in the operation of the system. Whenever a number of repairs are observed as the system operates, the folder is "pulled" and analyzed for a possible replacement based on factual evidence.

The **map book** is a convenient size (24-in. by 27-in.), and easily handled.

The **leak folder catalog** is in a standard size (8½-in. by 11-in.) ring binder, while the **date book** is a small "Daily Reminder" (6-in. by 9-in.). The **street opening survey reports** are maintained in small (6-in. by 9-in.) ring binders. All records are conveniently located in one small area in the operating section office.

How Program Works

It might be well to follow the life of a leak folder:

A new leak is discovered and repaired.

The date, location and origin is recorded in the leak folder catalog, opposite the first unused number. This number is stamped on a folder, which will contain a layout of the gas piping covering approximately one block and the records of repair. The folder number is posted in the map book at the location of the leak and in the date book, depending on when the folder should be re-checked. This is determined from conditions reported by the repair foreman. The folder is filed.

On the day set up in the date book, the folder is withdrawn from the file for a field check by a two-man crew equipped with a combustible gas detector and necessary tools.

From their report, it is determined whether more repairs should be made or whether to post the number ahead in the date book for a subsequent re-check. This process of re-checking keeps the folder alive until enough evidence is collected to warrant a replacement.

San Diego Gas and Electric Company has no mathematical formula for determining when and what length replacement is necessary. The decision to replace is based on a review of the leakage history covering the section of pipe under consideration by experienced personnel. However, the decision may be influenced by additional factors, for example, state and city street and road improvements.

San Diego Gas and Electric Company leakage and replacement practices are practical methods for controlling leakage and for determining when replacements should be made.

Acknowledgment

The article adapted from a presentation made at the Pacific Coast Gas Association Distribution Conference, Santa Barbara, California, May 1959.

* * *

For large volume storage facilities at peak-shaving plants . . .

Pre-Stressed Concrete Pipe Proves Practical for LPG Storage

R. J. Sweitzer, *Director of Research, Lock Joint Pipe Company, Orange, New Jersey*

CONCRETE PIPE has a long record of outstanding service for the transmission of aqueous liquids. Until the advent of prestressed designs, however, there were limitations on economical use of concrete for high pressures. More recently, prestressed concrete with an embedded steel cylinder has been used for transporting and storing hydrocarbons.

In 1942, 21,000 ft of 20-in. diameter rubber and steel jointed prestressed concrete cylinder pipe was installed as a pumping line for hydrocarbons (gasolines, solvents, oils, etc.) at an operating pressure of 300 psi. This line was constructed for a Naval Depot in Penniman, Virginia. An installation for the storage of 8000-gal of liquefied petroleum gas was put into operation by a propane distributor in Orangeburg, South Carolina, in 1954.

In 1956, hydrostatic and aerostatic tests on 48-in. and 60-in. prestressed concrete embedded cylinder pipes for use with liquefied petroleum gas storage were conducted by the Underwriters Laboratories, Inc. Complete details of these successful tests are contained in a *Fact-Finding Report, Miscellaneous Hazard 6544,* dated February 25, 1957, published by the Underwriters Laboratories, Inc.

The permissible working stress in the steel of conventional reinforced concrete is limited by the lack of tensile properties of concrete. This necessitates using large amounts of reinforcing steel at relatively low working stresses so that deformations caused by working loads do not place the concrete in excessive tension.

By prestressing, an initial high tensile load is induced in the wire reinforcement and is resisted by compression in the concrete. Under working conditions, this induced compression must be relieved before the concrete goes into tension, thereby greatly increasing the permissible deformation of the concrete while resisting the working load. This results in establishing an ideal relationship between the stresses in the steel and the concrete, and permits them to operate as an elastic structure. Prestressing has its maximum efficiency in reinforced concrete structures subject to forces that tend to produce tension. This principle has been incorporated advantageously in the prestressed embedded cylinder pipe. A cross section of this type of pipe is shown in Fig. 1.

Fabrication of Pipe

Flat sheet steel is received from steel mills in suitable lengths and widths such that two or more sheets provide the required circumference (Fig. 2). These sheets are rolled to proper diameter, assembled on a frame and welded together. Previously fabricated bell and spigot joint rings are then attached to the ends of the steel cylinder. During attachment of the rings, an assembling frame holds the rings square to the exact length required while the structure is tacked together. Each ring is welded circumferentially to the cylinder. Electric arc welding is utilized throughout the fabrication of the cylinder (Fig. 3).

After this fabrication, special heads are secured to the end, and it is tested hydrostatically, at a pressure that produces a stress of 25,000 psi in the steel (Fig. 4). This tests the steel and all circumferential and longitudinal welds for strength and tightness. Should leakage be detected, repairs are immediately made and the cylinder is tested again.

Following completion of the hydrostatic test, the steel cylinder is set aside for testing for gas tightness. This is done by one of the following methods, each giving comparable results:

1. Magnoflux Zyglo Method. In this method, Zyglo Penetrant is brushed on the outside surface of each seam and joint of the steel cylinder. It is allowed to penetrate for 20 or more minutes. Subsequent to the penetration period, an ultraviolet light is directed on the seams and joints on the inner side of the cylinder seams. The penetrant has the ability to seep through minute cracks and pinholes. Under ultraviolet light, the penetrant fluoresces, permitting the detection of defects in the welded seams and joints.

2. Turko Dy-Chek Method. Similarly, this penetrant is brushed or sprayed on welded seams and joints on the outside of the steel cylinder. After a specified time, a developer is brushed or sprayed along the seams and joints on the inside of the cylinder. Defects in the welded seams and joints are shown by the presence of a characteristic color.

3. Bubble Soap Method. The

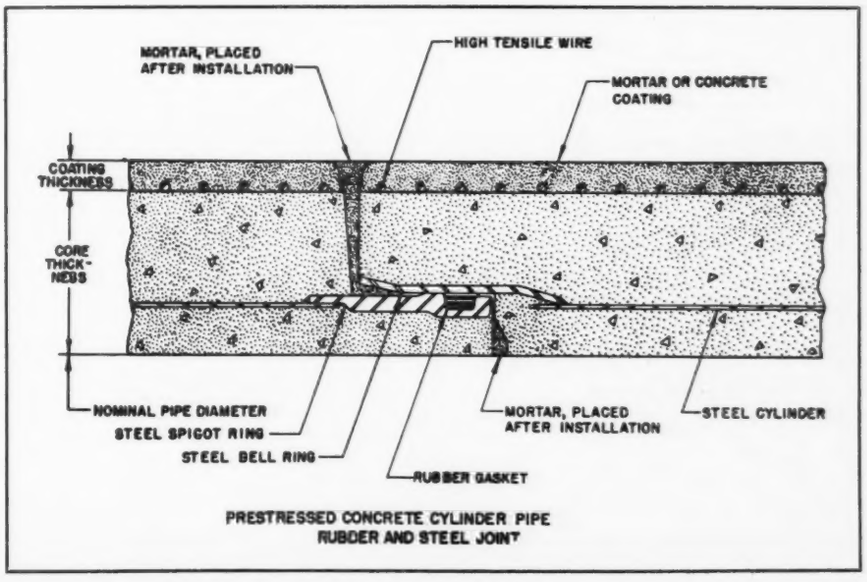


FIG. 1. Cross section of pipe showing wall and joint details.

FIG. 2. Assembly of several sheets of steel to make a cylinder.

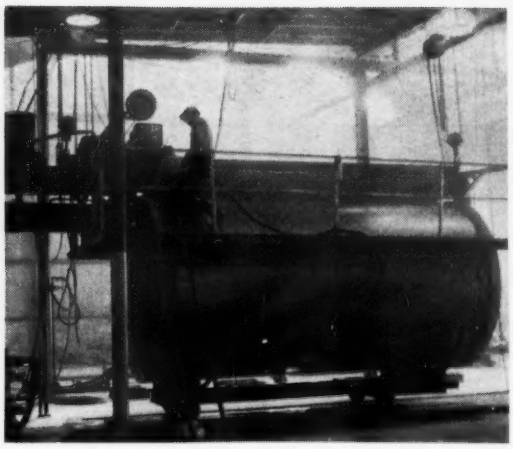


FIG. 3. Electric resistance welding of the closing seam.

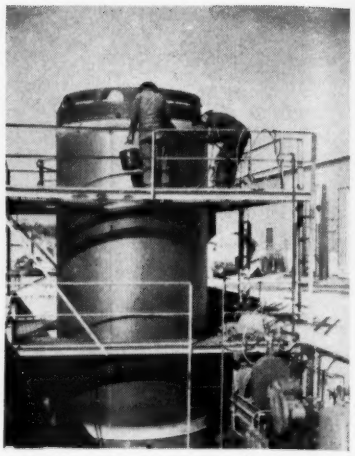


FIG. 4. Hydrostatic test of completed cylinder.

steel cylinder is placed under air pressure, and a soap solution is carefully brushed along each seam and joint weld. Leakage at the seams or joint is indicated by a formation of bubbles.

With the exception of the gasketed joint, the gas sealing features of the pipe are now complete. The remaining manufacturing steps make it a high pressure structure wherein the steel portions are completely protected with concrete or mortar.

The fabricated steel cylinder is mounted vertically on a base, designed to hold the cylinder and the inside and outside molds concentric. A steel ring is then placed over the top of the cylinder mold to assure concentricity (Fig. 5). Concrete is delivered into the annular space between the molds from a bucket placed in the top ring. The bucket is so constructed that the flow of concrete is controlled and distributed evenly around the mold. These concrete cores are then suitably cured until the concrete attains the desired strength. During this curing period, they are not moved. After curing, the cores are ready for the prestressing operation.

Following curing, the core is placed on a special tension winding machine and hard drawn high tensile steel wire is firmly anchored to one end. The core is rotated on trunnion rollers if being prestressed horizontally or on lathe heads if prestressed vertically. The wire is wound helically on the pipe under a constant uniform tension. The vertical tension winding method is shown in Fig. 6. The winding machine is designed so that the spacing and tension of the wire are controlled closely.

The last structural operation is the provision of a suitable protective coating for the prestressing wire. The study of various protective coatings used in past years to protect steel pipe installed in the ground has shown that either cement mortar or concrete provides the best protection. Either of two methods is used to accomplish this purpose. One utilizes a special machine that applies cement mortar to the exterior surface of the pipe (Fig. 7). This mortar is fed between counter rotating wire brushes, which eject the material at a velocity of about 120 ft per second against the slowly revolving pipe. As the coating machine travels parallel to the rotating pipe, a ⅞-in. mortar layer is deposited. On large diameter pipe, an alternate coating may be used (Fig. 8). This is a coating of poured and vibrated concrete placed similarly to that of the core.

Fig. 1 shows a cross sectional view of the joint ring used for joining pipe. These rings are fabricated by the Lock Joint Pipe Company. Flat steel stock used in the fabrication is required to conform to precise and rigid specifications. The joint ring steel is cut to specified length and rolled to a required radius. The free ends of the rings are butt-welded by the electric resistance method. After excess weld material is removed, the rings are placed in a hydraulic press, which expands them to proper dimension. This also checks the integrity of the weld. Each bell and spigot ring is checked with a plug and ring gage for proper tolerance. All rings are given a protective coating, which usually is zinc.

The spigot ring is provided with an annular groove to confine a round synthetic rubber gasket. This gasket is stretched and placed in the spigot groove before the lengths of pipe are

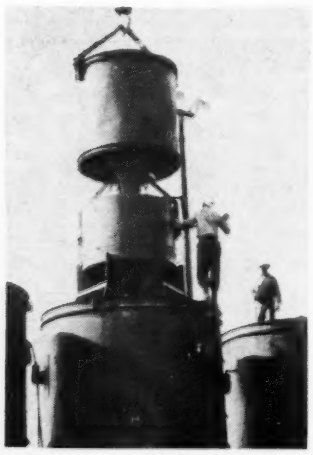


FIG. 5. Pouring of the core of pipe.

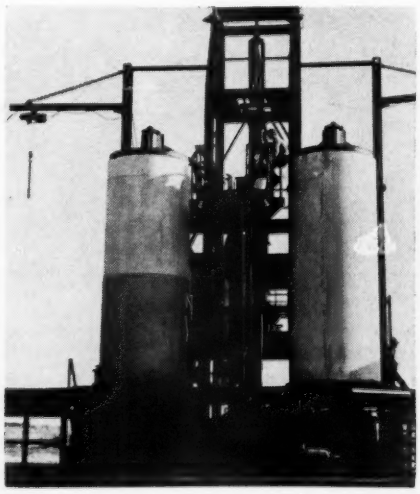


FIG. 6. Vertical prestressing of a concrete core.

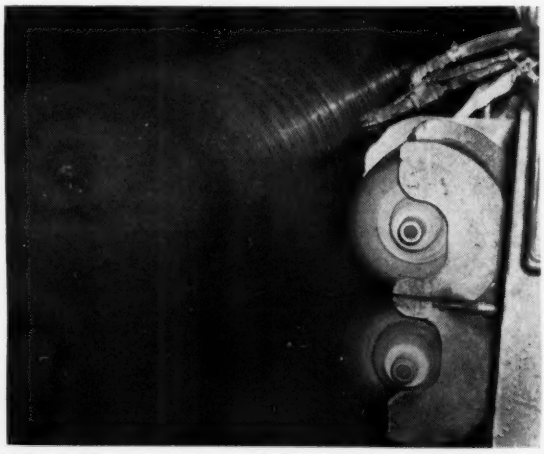


FIG. 7. Placing coating with horizontal machine.

FIG. 8. Placing coating by pouring.

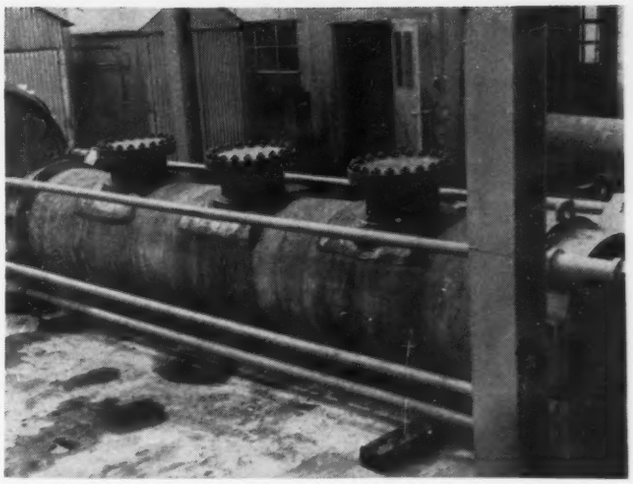


FIG. 9. Hydrostatic test of three outlets.

joined. When the spigot is inserted into the bell, the gasket is compressed from a round to an almost rectangular shape between the joint rings, thus forming a tight flexible joint between the adjacent lengths of pipe. These gaskets are volumetrically measured to insure that the exact amount of a suitable compound is available to fill the annulus and provide a gas tight seal.

Fig. 9 shows a length of pipe with three outlets under test. Such outlets, when required, are manufactured into a straight section of pipe but they also can be made as a fitting. When a pipe is constructed with an outlet, a heavy steel saddle plate is welded to the outside of the cylinder. A circular hole is then cut through the saddle in the cylinder, and a short sleeve shaped to conform with the curvature of the pipe is inserted in this opening. This sleeve is then welded to the saddle plate to produce a tight joint. The thickness of the saddle plate is such that the nonprestressed section of the saddle and the cylinder is reinforced to a strength comparable to the adjacent prestressed straight pipe. The applied mortar is reinforced by welded mesh which is tacked to the saddle. A steel plate neckpiece is fitted into the sleeve and these parts are then welded together. The end of the neck is provided with a flange to receive the bolted cover plate. Elbows and tees are fabricated similarly, but are not necessarily flanged.

Installation of Pipe

Enlargement of facilities at the Wharton, New Jersey, plant of the Lock Joint Pipe Company dictated a study of the fuel requirements for heating and processing. A consulting engineering firm recommended the installation of a 30,000-gal storage vessel, and suggested that prestressed concrete embedded cylinder pipe be used. All design data were based on this type installation. In accordance with the design, thirteen 16-ft lengths of 60-in. ID pipe were installed (Fig. 11, and 12).

A pipe design was determined by careful consideration of the physical differences that exist in operational behavior of a hydrocarbon under static pressure, and a flowing liquid having static pressure and kinetic forces. The 13-section pipe, having a volume of 29,300-gal, was laid and bulkheaded in the trench excavated at the site selected, and concrete thrust blocks were poured, as shown in Fig. 13.

A flow meter was installed in the intake line, and an *inch of diameter vs. gallons* calibration curve was prepared. A 24 hour hydrostatic test at 250 psi was conducted in accordance with a

FIG. 10. Placing a pipe in the line.

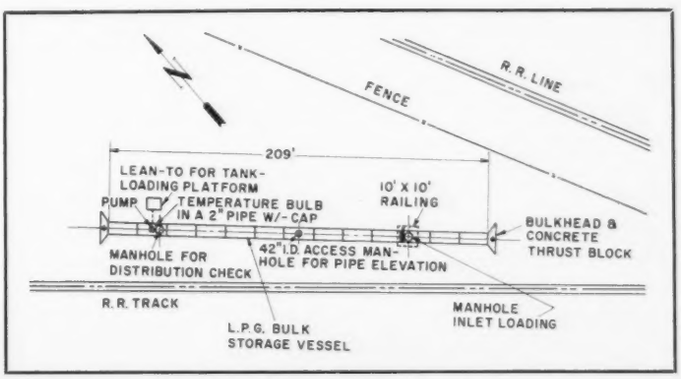


FIG. 11. Overall view of buried storage vessel.

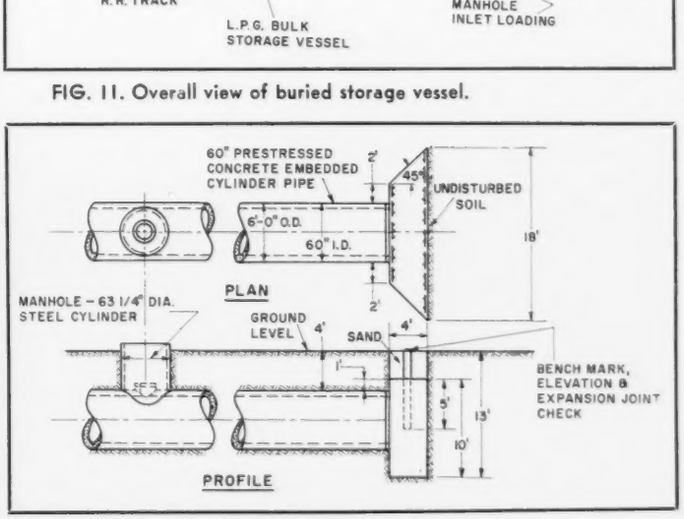


FIG. 12. Details of buried storage vessel.

FIG. 13. Pouring of concrete thrust blocks.

FIG. 14. Overall view of partially buried vessel showing manholes and bench marks.

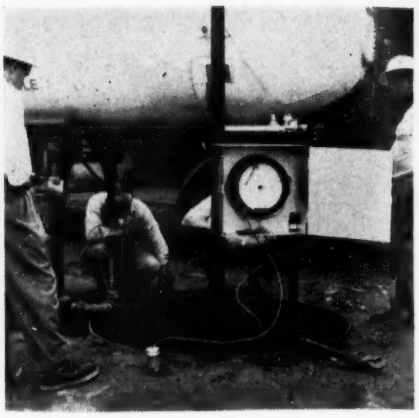


FIG. 15. Filling vessel with LPG. Note temperature recorder.

State Department of Labor and Industry requirement. Bench marks were cast in the thrust blocks for the purpose of measuring change in length of the line due to temperature or pressure (Fig. 14). Similarly, one was cast in a special access manhole in the center of the container for change in elevation determination. Before filling with propane, a dual probe thermometer was installed (Fig. 15), which records the temperature of the product and the ground at the spring line of the container. Fig. 16 shows a typical weekly chart. These latter provisions were made in order to accumulate performance data. Tests revealed no leakage in the container. Elevations of the line were unaffected by the pressure and elongation of only 0.03-ft in 214 ft was noted. The charts show that, because of relatively constant environmental temperature, the product pressure is reasonably constant.

Conclusions

The design working pressure of an underground storage vessel need not be the same as a conventional tank. An investigation of soil temperatures found that, even in Texas, the highest temperature recorded at a depth of 4 ft was 72 F. At that temperature, commercial propane has a vapor pressure of 125 psi. Product temperature quickly approaches ground temperature in either warm or cold weather. This has been proven by actual recordings on the storage tank herein described.

Because the container is buried, the hazard of exposure to fire is practically eliminated. This is important from an insurance standpoint. Because the container is not exposed, it cannot normally be damaged by mobile equipment. It is maintenance free, and there are no periodic costs for chipping, sand blasting, scraping, or painting. Efforts have been made to beautify conventional containers, sometimes successfully. Nevertheless, in some areas, particularly those with zoning problems, the use of any exposed container is prohibited. Installation of the buried types leaves visible only a guard fence and piping appurtenances, which easily can be camouflaged with trees or shrubs.

The economies to be derived from the use of prestressed concrete pipe cannot be precisely stated. A relatively large portion of the installed cost is in the excavation. If this is reasonably easy, the total cost should be less than 75 percent of that of conventional storage. If large quantities of rock are encountered, however, the total saving might be somewhat less. It should be emphasized that these potential savings can be realized only on large installations.

Fig. 17 shows a typical plan for LPG storage of 25,000-bbl capacity (1,050,000-gal). Innumerable plans may be executed since the layout of the pipe depends only upon the amount of space available, and the imagination of the designer. Probably, the minimum economical storage vessel utilizing this material is about 100,000-gal. This could be installed in a small plot of ground, the area of which would be dictated by the shape of the container.

Prestressed concrete embedded cylinder pipe is not an experimental product. Millions of feet of large diameter pipe up to 120-in. are in trouble free operation. The adaptation of this pipe for LPG storage is a minor departure from its original designed use, and because of operating conditions, it is a far less stringent application.

Acknowledgment

This article adapted from a presentation made at the 1959 A.G.A. Chemical, Engineering, and Manufactured Gas Production Conference. * * *

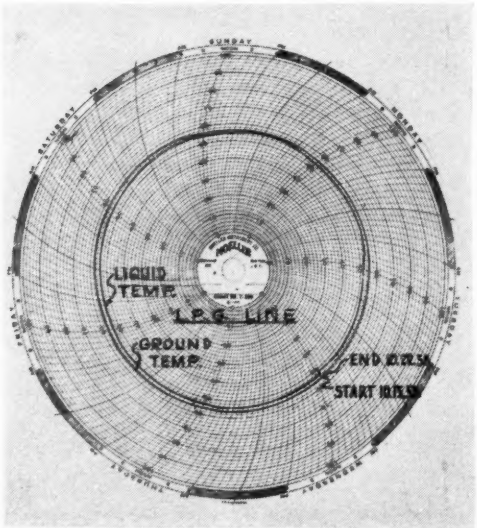


FIG. 16. Typical weekly chart of temperature recorder.

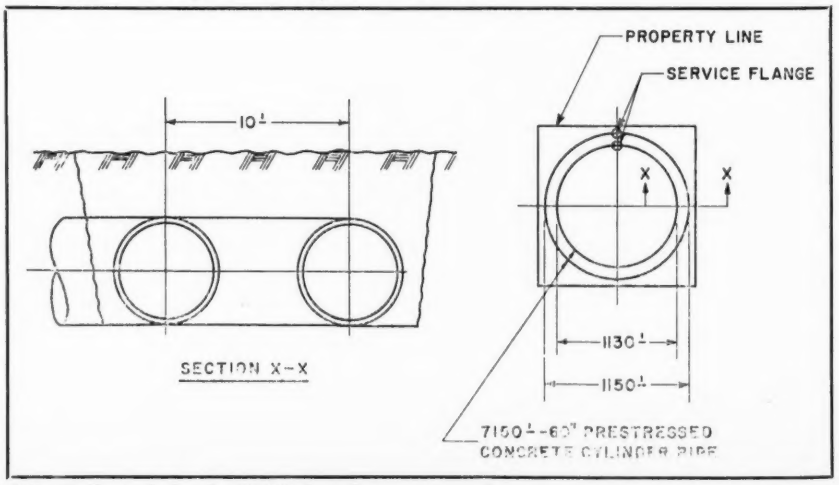


FIG. 17. Typical plan for 25,000 barrel storage vessel.

Quality Control in Customer Service

George S. Coates,
Manager, Customers Department
Southern Counties Gas Company of California
Los Angeles, California

I CAN REMEMBER A CONVERSATION that took place about eight years ago with a customer service supervisor. It went something like this:

"Frank, what kind of a job are your men doing?"

"Oh, George, I've got one of the best groups of men in this whole Company. They are all good, never have a bit of trouble, and they can fix anything."

"How do you know, Frank?"

"Well, I just know my men."

"Are you sure none of them is goofing off?"

"Yes, I'm sure because I check all the orders the next day after they are completed, look over all the write-ups and, if any of them look screwy, I ask the men about them."

This pretty well sums up what quality control meant in customer service in Southern Counties Gas Company about eight years ago. It was a swivel chair, paper review type of control. It is a completely different picture now. If I were to ask Frank the same question today, the conversation would go something like this:

"How are your men doing, Frank?"

Well, pretty good, George. I've got two or three who are a little bit of a worry. Joe just doesn't seem to be able to diagnose refrigerator problems very well, and Bill still has a lot to learn about what makes a good customer contact although he's a good mechanic. Of course, you know I have three new men who are coming along very well but they just don't have the savvy that comes with experience. Jack and Harry are still riding right up at the top of the list. Their work always checks out close to 100 percent."

"Keeping up with your field inspections pretty well?"

"Well, it's been a little rough here lately, but I've got up to about 90 percent on schedule and I think I can bring it up to date within the next month."

There is a good deal of difference between the answers Frank gives today and those he gave eight years ago. There is one thing in common, however, and that is that in both cases they were honest answers. Knowing the kind of quality we are getting from each customer service field man is important to us and is important to each man. But knowing is not easy, because the boss isn't on the job when the work is being done.

We have a quality control program in customer service now. It was not easy to get, and the idea was not popular with our supervisors at the beginning. Probably the biggest reason this was so was because the supervisor **thought** he already knew how his men were performing.

How we went about getting where we are today is the purpose of this report; a brief background on our company and how we operate helps make the story a little more understandable.

Southern Counties serves about 670,000 customers in southern California in 182 communities in a service area totaling 1200 square miles. We are a decentralized company with eight operating divisions, and there are about 300 customer service men in the field. Customer service is responsible for building meter set assemblies, installing meters, changing meters, turning gas on and off, adjusting appliances, making high bill and leak investigations, and turning gas off for non-payment of bills. There are 19 bases from which customer service men work, the largest with about 40 men and the smallest with two men.

Why Quality Control?

Why did we become interested in a quality control program? Well, we discovered that although what we did and how we went about doing it in one division bore some resemblance to what we did in another division, it was by no means the same. In fact, the quality of work performed in one section of a division might not be on a par with work performed in another section of the same division. Furthermore, each division thought it was doing a better job or at least as good a job as any other division, and this just was not so.

Instituting A Program

Our first job was to standardize procedures and, equally important, obtain agreement that the standard procedures were necessary and that the agreed-upon standard procedures were good ones. We learned the hard way on this one. The "smart boys" on customer service staff came up with standard methods of doing work and actually did a very good job. The only trouble was that, when we taught a new man according to these procedures, the first thing he bumped into when he started to apply them was a comment from his boss that went something like this: *"I don't care what you were taught, this is the way we do it here."*

We were a little smarter the second time. We made sure the division manager and the division superintendent knew what we were trying to do and got their support. We talked to the customer service supervisors and reviewed the proposed standard procedures with them. Finally we had a meeting with them and thrashed out all points of disagreement. There was some give and take, and the result was agreement.

We then set up training on a centralized basis, so that we knew our customer service field men understood how the company wanted a job done and what a satisfactory quality job was. After the procedures were standardized and the men were trained so that we knew that they knew what was expected of them, we began a program of field riding with the men to see if they did it the way the company wanted it done. Right here we ran into trouble.

The supervisors and foremen did not have time to do the field riding. We took a look and, sure enough, they didn't, but the reason was that they were doing other things that were far less important or completely unnecessary or could be done better by someone else. Actually, instead of being supervisors or foremen, they were more closely akin to combination high-grade clerks and mechanics, and were shuffing papers around in the office, making reports, dispatching, and personally taking care of difficult customer or appliance problems.

In other words, they were glued to their desks a good portion of the time and got out in the field when they thought that more than an ordinary amount of mechanical ability was required. We then started to determine why we had hired customer service foremen and came to the conclusion that, although they did not have a crew

working under their direct supervision, their main functions were the same as the crew foremen: That is, to know what their men were doing and to train them when it was apparent they needed it.

We eliminated some unnecessary clerical operations, we transferred those that were considered important to clerks, and by training our men to do a better job, eliminated the need for most of the special mechanical work being performed by foremen. It was a bit difficult getting across to our supervisors and foremen that the "gold star" did not come from being the best mechanic but rather from being able to get the best work from their men.

Inspection Is Important

By this time we had come a fair distance along the road to quality control but we were by no means there. Our foremen knew what a good job was and they knew whether their men were capable of performing a good job. What they didn't know was whether their men performed a good job when they weren't around to watch them do it. We then got busy on a work inspection manual.

The first paragraph in this manual reads as follows:

I. Purpose of Work Inspection

The purpose of the work inspection program is to determine whether work being performed by customer service personnel on customers' premises is in accordance with accepted procedures and standards. The program involves the follow-up inspection of completed orders for the purpose of obtaining a continuing sample of each fieldman's job performance. From the findings obtained from such field inspection it is possible to determine:

1) which personnel are doing satisfactory work;

2) the effectiveness of current training and the areas in which further training is needed;

3) the general acceptance of our service policies by our customers and their feeling toward the company;

4) whether all of our service policies, procedures and methods make "good sense."

The work inspection program is really quite simple. Each customer service boss is charged with taking a look at some of the work performed by each one of his men during each six months' period. The amount of inspection must be sufficient to provide assurance that the man knows his job, adheres to company policy and procedures, and conducts himself on the customers' premises in a manner consistent with safety and customer relations. It may be necessary during any six months' period that more emphasis be given to low standard performers than to those who have established themselves as good performers.

Here is how a field work inspection procedure works: Inspectors observe the work completed on the basis of the type of order that was worked and the information reported on it. The inspector attempts to check out every phase of the work that the field man went through, as well as any work or procedure that was called for by the order but was not followed by the fieldman. The inspector avoids as much as possible any discussion on work inspection activities, but instead invites and directs the customer's conversation toward finding out if the work performed was done properly and to the customer's entire satisfaction. If, prior to, or any time during the course of the inspection, the customer does not appear to be agreeable to the inspection, contact is concluded as smoothly as possible.

The approach we make to the customer is,

"Good morning, Mrs. Jones. I am from the gas company. I stopped by to look at your range after we adjusted it Friday."

Occasionally a customer will ask, *"What are you doing, checking the other man's work?"*

We answer, *"Yes, as part of our continuous training program, we look at some of the work all of the men do."* We have found that this reply is generally very well received.

The inspector never asks questions about the fieldman's ability, nor does he imply in any manner or form that the work was of a poor quality. Clean-up work of a "super-serviceman" nature on the part of the inspector only impresses the customer that the serviceman did not do a good job. However, inspectors will work on customer's appliances:

1. When the customer requests it.
2. When the customer appears to be aware of an operating difficulty.
3. To establish the validity of an error.
4. To correct a hazardous or potentially hazardous condition.

Uniform inspection procedures are of prime importance in obtaining factual data. Inspection tolerances set up in the manual are considered to be well within the scope of the servicing policy, and it is important that every supervisor performing inspection work adhere to the tolerances regardless of his personal opinion. We realize that the inspection tolerances are not all inclusive, that the adjustment of gas appliances is not an exact science, that borderline cases do occur, and that information is often incomplete or inconclusive.

When these situations occur, our inspectors always give the serviceman the benefit of the decision. The inspector considers that every order has a proper means of completion. The fieldman's means of completion may be either actual correction while on the premises, issuance of a follow-up order, issuance of a parts order, an oral referral, or the issuance of a notice of unsatisfactory conditions. Credit is given for the job when a proper referral is made or another order is issued. It is the inspector's responsibility, however, to determine that the proper procedure was followed, and when he is in doubt whether a possible correction could have been made within the scope of company policy, he actually attempts to make the correction. The fieldman is given credit if the correction cannot be made and an error when the correction can be made within company policy.

We have three classifications of fieldmen—meterman, serviceman and service mechanic. The meterman is the lowest classification, but we require that he perform the same quality of work as men in higher classifications, even though the meterman may be required to issue a follow-up order to get the work completed, whereas a serviceman or service mechanic would make the actual correction. In other words, work performed by all customer service field personnel is inspected by the same tolerances.

Grading of Work Performance

Four degrees in error are used in grading a man's work: A, B, C, and D. Our work inspection manual classifies in detail all A, B, C, and D errors. A general definition of the four degrees of error is:

An "A" error is any error of a strictly minor nature. These would include errors in writing up an order, such as work column improperly checked or work order not signed. However, clerical errors, such as an incorrect meter reading which could result in a repeat call, would be given a higher degree of error. This category also includes operational and procedural errors that are of comparatively small importance and do not materially affect operation of an appliance or company operations. Examples would be loose valve handles and noisy burner flames.

A "B" error is one that materially affects the operation of an appliance or company operations in which no haz-

ard is involved. For example: Delayed ignition to an appliance, or a meter set built without an outlet tee.

A "C" error is an error which constitutes a potential danger or where the fieldman damages the customer's property but does not report it and the damage could result in a claim against the company. Examples of such damage would be damage to an appliance, scratched linoleum, or excessive splattering of paint on the house.

A "D" error is one that constitutes immediate danger to life or property. This error is charged where, in the inspector's judgment, the fieldman left a condition that could immediately cause a fire, explosion or asphyxiation. Examples of such situations would be an appliance left on that is expelling harmful products of combustion into a confined inhabited location, gas left on in a single dwelling where a leak of 2 cu ft per hr or more exists in an unknown location, or gas turned on but not lighted to a thermostatically controlled appliance not equipped with a safety device.

Here are some of the things we check and our tolerances of error.

I. *The customer's opinion of our service is important.* While inspecting work on the customer's premises, the customer often makes comments concerning the company. These comments may be made on any phase of our operations in varying degrees of emphasis. Some of them when made seem very insignificant. When gathered together, however, they may form a very good picture of what our customers think of us. Because of their possible value as a survey of public relations, comments from customers are recorded.

Because such information cannot be used objectively as a true indication of the fieldman's actual job performance, it has no bearing on the serviceman's quality index but is used as a separate phase of the work inspection program.

Inspectors record all comments made to them that are in any way a reflection on the company operations, good or bad. They are then grouped under these classifications:

1. The ability or personality of the serviceman that called.
2. Customer's contacts with other company personnel; such as order clerks, sales department people, construction and distribution department, etc.
3. The service we give.
4. Gas rates and other charges, such as the charge for main extensions.
5. The cost of parts replacement.
6. Charges made by other service agencies; such as heating companies, plumbers, etc.
7. Service given by other utilities and cost of service.
8. Use of gas appliances versus use of electric appliances.
9. Difficulties with gas appliances that they blame on gas as a fuel; such as, wall discoloration and condensation.
10. Our public relations, generally.
11. About newspaper articles regarding the company.
12. Safety or hazards of using gas.
13. Other miscellaneous comments that indicate customer's opinions about the company or gas.

II. We want to be sure that what is written on a completed order reflects accurately what the man did when he completed it. Here are some of the things we check on order write-up:

1. Work columns or squares incorrectly marked.
2. Meter spot spaces not filled in.
3. Date and/or arrival and left times not entered.
4. Order not signed.
5. Meter reading incorrect.
6. Meter number not entered or incorrect.

There is a big pay-off on our work in this area. We used to require lengthy write-ups on what we found, what we did, and condition left. We even required the fieldman to state whether the customer was satisfied or dissatisfied. This last question was really crazy. What serviceman will write down very often that he was unable to please the customer?

Now, if the fieldman can complete an order using normal procedures, all he has to do is place a check mark in a column headed "normal adjustment." Believe me, this is popular with the men.

III. Here are some of the things we check in our meter set work:

1. Meter set not painted.
2. Curb meter not centered under reading lid.
3. Wrong type meter set.
4. Meter not identified on a multiple set.
5. Old age regulator not changed.
6. Insulating bushing painted with aluminum paint.
7. Meter set backward.
8. Improper size meter and regulator installed when requirements are known.
9. Regulator not vented to the outside where the meter is located under the house.
10. Damage to shrubbery, flower beds, etc., not reported to the company.

Understanding and Explaining Policy

Although the customer's appliance may be left in perfect operating condition, if he doesn't know how to use it, he can be in trouble — or if a serviceman follows company policy to the letter but does not explain the company policy, we are in trouble.

That is why we believe that a customer's understanding of appliance operation and company policy is very important. Whenever appliances are serviced in connection with turn-on orders, a new appliance is involved, or the reason for the fieldman's call is a situation concerning company policy, the inspector determines whether the customer he contacts is the same one contacted by the fieldman.

When the customer is the same, we ask: *"Did our man explain the proper procedure for care and operation of your refrigerator, dryer, or whatever the appliance might be?"* or *"Did our man explain the company's policy in this particular circumstance?"*

This question is slanted in the manner that if the fieldman did not explain this situation, the inspector will. Customers when answering this question generally give a complete story about the fieldman's offer to explain. When the customer's answer is not clear, however, we do not attempt to evaluate this check point. An error is charged whenever the customer was not informed or was misinformed on company policy or instructions were not given on the care or operation of an appliance, resulting in improper operation or customer dissatisfaction.

At the beginning, there was a good deal of disagreement among our supervisors as to whether the standards set up by the company were proper. The general feeling was that any mechanic worth his salt could do better than the standard. For example, if a top burner on a range is left adjusted so that it is not more than half again as high or not more than half again as low as it should be and the customer is satisfied, the man is to be considered as having done his job properly. However, experience has shown that if adjustments are made within the allowed tolerances, the appliances work safely

and satisfactorily, and after all, that is what we are after. Furthermore, the men who are being judged on the quality of their work can agree that the company is fair in the way we go about judging them.

There was one other factor that went into the making of these standards. The company wanted a good job done, but we did not feel we could afford a perfect job. If a satisfactory adjustment could be made in five minutes but a perfect adjustment took ten minutes and the customer did not know the difference, why should we spend the extra five minutes?

Now we had three important steps under our belt. We knew the kind of job we wanted done; we had set up training so that the men knew what we wanted done and how to do it; and we had set up a method whereby we could judge the quality of the work after it was done. We were now ready to crack the really tough nut. We had to get our foremen to call back after the man had completed his work, inspect it and judge it according to standards of performance.

If I were to set out to become the most popular man in the gas company, I surely wouldn't go about it by saying to foremen and supervisors: "I want you to take a group of each man's completed orders and follow up the next day by punching doorbells and saying, 'Mrs. Housewife, I am from the gas company. Our man was here yesterday and I want to take a look at what he did'." If I were the foreman, I might agree wholeheartedly that this made sense and was a good idea but that it was a far better idea for someone else to do it rather than me!

We moved into it rather slowly but kept the pressure on and, as our foremen began to make field follow-up calls, they found it wasn't half as bad as they thought it would be. Almost without exception, our customers thought it was a good idea and that it was a reasonable thing for us to follow up on a percentage of each man's work. We gained something from the customers' reaction — that we were a businesslike organization, interested in the kind of job we did for them. The other thing that the foremen found out was that, although some of their men knew what they were supposed to do and knew how to do it, they were short-cutting when they got on the job.

Making Inspections Effective

In addition to the work inspections being made by our operating people in the divisions, we set up a work inspection team in our general office staff that made inspections in all divisions. We found that generally the percentage of error found by the staff inspection team was considerably higher than the percentage of error found by the division supervisors. In other words, the staff boys were much tougher and were calling all the shots. We found, also, that there was considerable difference between divisions on how close the shots were called. Our staff fellows would then make inspections with the division supervisors, each would prepare his own analysis form and then, after the inspection, they would compare them. We found this a very effective way to train the supervisors. In fact, we found that some supervisors really didn't have a very good idea of a poor job when they saw one.

We now had four of the ingredients we considered important to a quality inspection program. We knew what we wanted done, we had set up training so that the men knew what we wanted and how to go about doing it, we had set up standards for evaluating a good job, and we were making inspections and judging a percentage of each man's work against the standard. There was still something lacking. We were not using this information effectively to get better results.

The company is wasting its time and its money when it knows that work is not being performed according to standard and yet fails to do anything about it. We, therefore, set up a card for each man and recorded on this card how he was doing whenever we made a work inspection. We also provided on this card a space for the foreman to write down what he had done about it. In other words, we feel that each man has a right to know how he is doing and every supervisor has an obligation to tell him. When we started on this, we suggested that the foreman first of all talk to the men who were doing a good job so that, when he talked to the man who was doing a poor job, that fellow could get very little if any sympathy from the group.

Supervisor Must See and Act

One principle that we have stayed with and think very important is that the supervisor himself should do the inspecting rather than have an inspector do it and report to him. This belief is not shared by all who have work inspection programs. One reason is a feeling that an inspector can be more impartial and objective than a supervisor. Another is that the supervisor does not have time.

The office supervisor or the crew foreman does not delegate his obligation to know what his people are doing, and he acts upon what he sees. Just because it is more difficult for the customer service supervisor to find out what a man does — and how he does it — does not, to me, change his obligation or his right to act upon what he sees. At the beginning of our program, some of our people did not like it because they felt they were snoopers.

This reaction in itself pointed up a very real need for understanding of supervisors' responsibilities. There is no one in our company who is immune from having someone — with a perfectly legitimate right to do so — take a look at what he is doing and how he is doing it. The man who is doing his job likes to have somebody know he is doing it well; the man who resents it can only resent it because he is fearful. Furthermore, if the supervisor sees for himself, he is motivated to act on what he sees. If someone tells him that some of his people are not doing a good job, he may be disinclined to believe. If the supervisor is unfair in his evaluations it will soon come to light, and he will then be brought into line or he is not qualified to be a supervisor.

In Summary . . .

Earlier, it was stated that the purpose of work inspection was to determine:

1. Which personnel were doing satisfactory work.
2. The effectiveness of current training and the areas in which further training is needed.
3. The general acceptance of our service policy by our customers and their feeling toward the company.
4. Whether all our service policies, procedures, and methods make good sense.

I believe we are accomplishing our purpose and, in addition, have obtained some side benefits that are just as important as our original objectives. For example: Foremen and supervisors have a new and better concept of their jobs. Our fieldmen know that somebody cares how they do their job and, if they don't do it properly, it is likely that somebody will know it. If they do a good job, they will likely get the pat on the back they deserve. Our customers' impression of our service has been enhanced, and we are getting more and better work for a reasonable cost.

We think the Southern Counties Plan fits us pretty well, but that doesn't mean it fits anyone else. I believe, however, that quality control in customer service is worth having and is something that every good gas company should have.

Acknowledgment

This article developed from a presentation made at the 1959 SGA Annual Meeting in New Orleans, Louisiana. ★ ★ ★

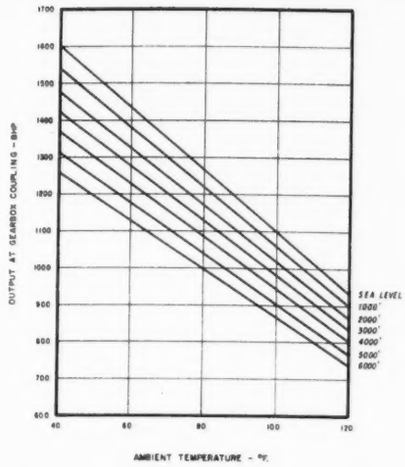


FIG. 1. Brake horsepower vs. ambient temperature for various altitudes, Model TA gas turbine.

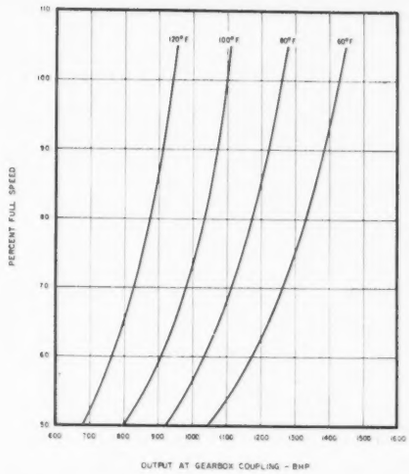


FIG. 2. Horsepower output vs. percent of rated speed at various ambient temperatures at sea level, Model TA gas turbine.

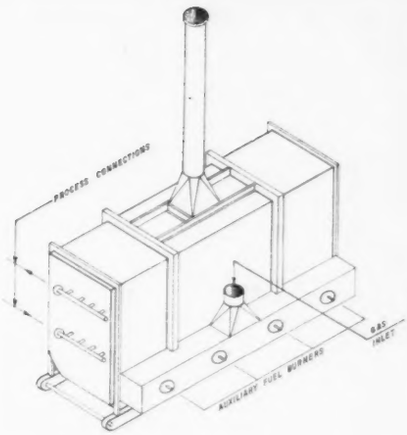


FIG. 3. Waste heat exchanger (boiler) of forced circulation type.

"Total Energy Conversion" Concept Makes Gas Turbine Applications Profitable

HOW TO CALCULATE GAS TURBINE EXHAUST HEAT UTILIZATION

C. R. Apitz, *Gas Turbine Applications Engineer, Clark Brothers Company, Houston, Texas*

ONE OF THE INHERENT ADVANTAGES OF THE GAS TURBINE that make it attractive for many industrial applications is the fact that it provides both an economical source of shaft energy, and that its exhaust heat can be economically recovered for use in other processes.

The *"total energy conversion"* concept made possible by the gas turbine is an important development. All power cycles are for the conversion of fuel energy to more usable forms. Some cycles produce only shaft power. The gas turbine produces both shaft power and recoverable heat energy, making it the most efficient cycle commercially available to industry. Through the use of properly designed waste heat recovery equipment, savings in fuel are added to the other advantages of lower maintenance, and lower operating costs attributed to the gas turbine.

To understand how and why this is possible, it is necessary to review the basic gas turbine cycle. The Clark Model TA turbine is used here as an example. Similar data is available for other turbines upon request from the respective manufacturers.

The Model TA cycle begins with the introduction 22.6 lb per second of air into a 13-stage axial compressor at suction conditions of 80 F and 14.7 psia. This air is compressed through a 4:1 ratio and is discharged into the combustion chamber, where it is heated by fuel burning to 1390 F. Fuel is used for heating the compressed air at the rate of 16,300 Btu per brake horsepower per hour. From the combustion chamber, the hot air passes through four stages of expansion and is exhausted to the atmosphere at a temperature of 890 F.

Through the use of the heat available in the 890 F exhaust gases it is possible to bring about what is known as "total" application of energy.

At its nominal sea level rating of 1265 bhp at an ambient temperature of 80 F, the turbine will burn 20,600,000 Btu per hr. Of this heat input, 3,210,000 Btu per hr can be recovered as shaft horsepower output.

Depending upon the level of process heat required, the 890 F exhaust gas heat can be exchanged against a process stream to obtain additional energy recovery.

For example, if steam is to be made with a 212 F feedwater temperature, a commercial waste heat boiler of the forced circulation type can be used. This boiler, shown in Fig. 3, will cool the exhaust gas down to about 350 F and will recover 11,300,000 Btu per hr. This results in a total energy re-

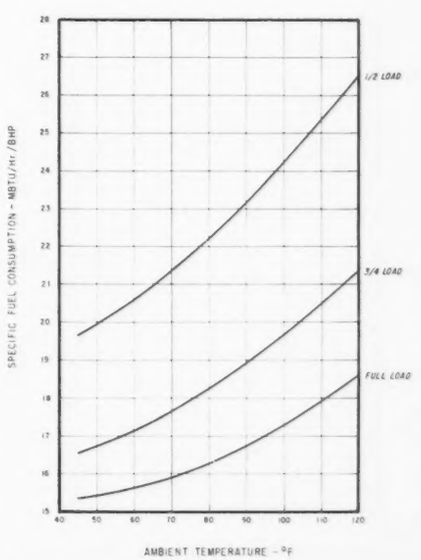


FIG. 4. Specific fuel consumption vs. ambient temperature at sea level, Model TA gas turbine.

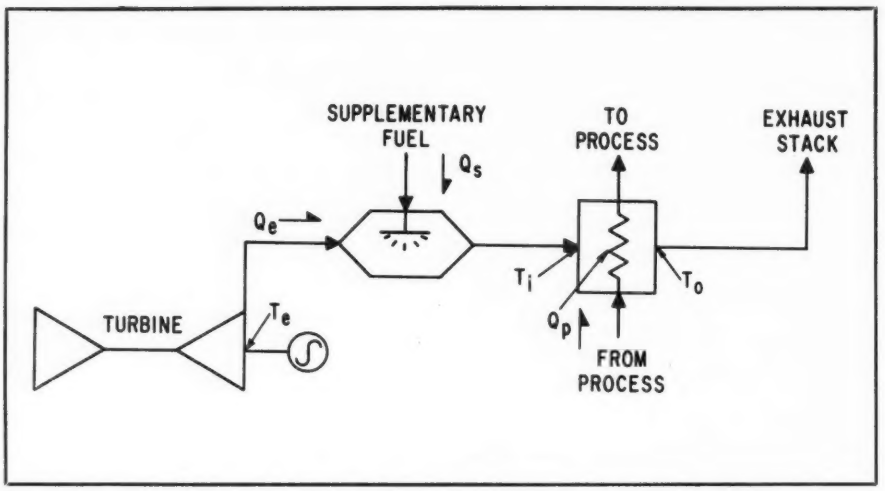


FIG. 5. Heat flow diagram shows points of temperature measurement (T) and heat flow (Q).

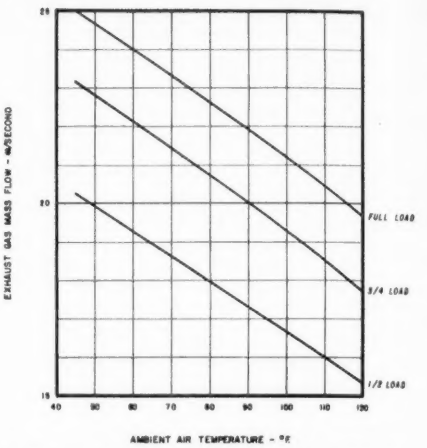


FIG. 6. Exhaust gas mass flow (M) vs. ambient temperature at sea level, Model TA gas turbine.

covery of 14,510,000 Btu per hr (shaft output plus boiler recovery) for a thermal efficiency of 70 percent, quite good compared to other cycles.

If the process heating requirement is greater than the amount of heat that can be supplied from the exhaust gas by simple heat transfer, an in-line combustion chamber can be added in the duct between the turbine and the heat exchanger, or a burner can be placed in the bottom of the waste heat boiler.

Because the turbine normally operates on a very lean fuel-air ratio, and the hot exhaust gases contain approximately 17 percent oxygen by volume, fuel can readily be burned directly in the exhaust gas stream at 95 percent efficiency. The amount of supplementary fuel that must be fired in meeting process heating requirements that are greater than those that can be met by simple heat exchange alone, can be estimated by the general heat transfer formula:

$$Q = M\,C_p\,(T_i - T_o)$$

Where:

Q = Quantity of heat in millions of Btu per hr to be added to exhaust in refiring

M = Mass flow of heat in lb per hr

C_p = Specific heat of the exhaust gases at average temperature and pressure

T_i = Exhaust gas temperature at the heat exchanger inlet, degrees F.

T_o = Exhaust gas temperature at the heat exchanger outlet, degrees F.

For example, assume a process load of 25,000,000 Btu per hr in heating water from 200 F to 400 F. The mass flow of exhaust gases from a Model TA gas turbine is 22.6 lb per second, or 81,500 lb per hour. For purposes of estimation, the specific heat (C_p) of the exhaust gases being cooled in the heat exchanger is assumed to be 0.25. Also assumed is a 100 F approach to the incoming water temperature, which is good commercial practice for heat exchangers of this type. Therefore, $T_o = 300$ F. It is then necessary to solve for the inlet temperature (T_i) of the exhaust gas to the exchanger.

To accomplish this, the general heat transfer formula is modified as follows:

$$Q_p = M\,C_p\Delta T$$

Where:

$Q_p = Q_e + Q_s$ (Q_e = heat available in turbine exhaust gas stream and Q_s = supplementary heat added)

$$\Delta T = T_i - T_o$$

Using this modified formula and data given above, the inlet temperature can be found thusly:

$$Q_p = M\,C_p\Delta T$$

$$25{,}000{,}000 = (81{,}500)\ (0.25)\ (\Delta T)$$

$$1230\ F = \Delta T = T_i - T_o \quad (T_o = 300\ F)$$

$$T_i = 1230 + 300 = 1530\ F$$

This means that the exhaust gases must be heated to 1530 F before entering the heat exchanger, to permit recovery of the required 25,000,000 Btu per hr at the desired temperature level. The amount of fuel that must be added to heat the exhaust gas from its normal exhaust temperature of 890 to 1530 F may be calculated accurately or it may be estimated with reasonable accuracy by applying the same heat transfer formula as above with only a slight change, as follows:

$$Q_s = \frac{M\,C_p\,(T_i - T_e)}{0.95}$$

Where:

Q_s = Amount of fuel to be added, millions of Btu per hr

M = Mass flow, lb per hr

C_p = Specific heat of exhaust gases at average temperature and pressure

T_i = Exhaust gas temperature at heat exchanger inlet, degrees F, as determined above

T_e = exhaust gas temperature at turbine exhaust outlet, degrees F

0.95 = refiring efficiency

The average of the turbine exhaust temperature (890 F) and the heat exchanger inlet temperature after exhaust refiring (1530 F) is 1210 F. Specific heat of the exhaust gas stream being heated from the turbine exhaust to the exchanger inlet is 0.257. Mass flow is again 81,500 lb per hr. Substituting in the above, the supplementary firing input is found as follows:

$$Q_s = \frac{(81{,}500)\ (0.257)\ (1530 - 890)}{0.95}$$

$= 13{,}400{,}000$ Btu per hr

When an operation of this type is considered from a thermal efficiency standpoint, some interesting points of application arise. In the example just calculated, the total fuel input is 34,000,000 Btu per hr, consisting of 20,600,000 Btu per hr fuel input to the turbine and 13,400,000 Btu per hr supplementary firing. The heat utilization consists of 3,210,000 Btu per hr recovered in shaft power output, and 25,000,000 Btu per hr utilized in proc-

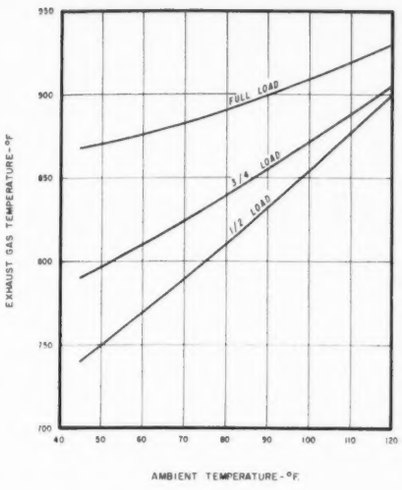


FIG. 7. Exhaust gas temperature vs. ambient temperature at sea level, Model TA gas turbine.

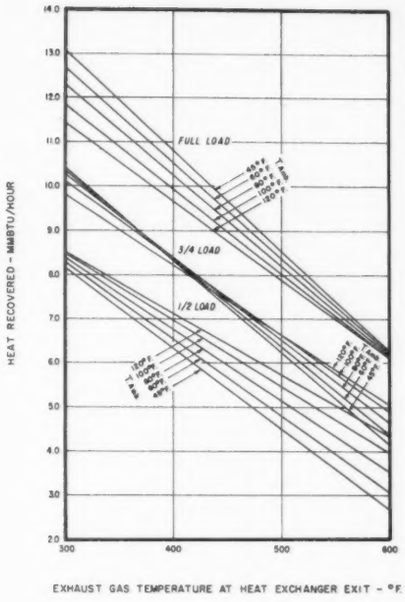


FIG. 8. Heat content of exhaust gas as a function of heat exchanger exit temperature, Model TA gas turbine.

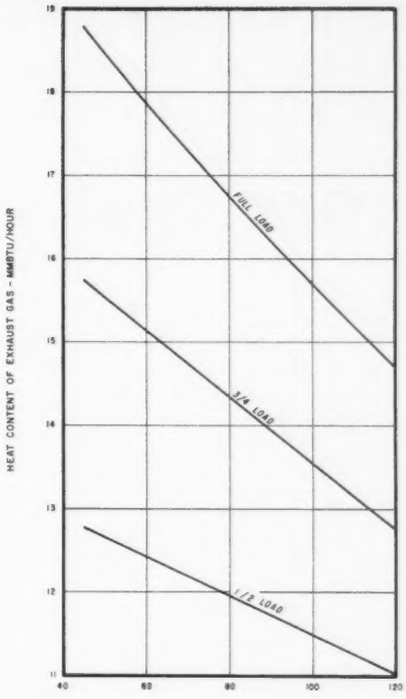


FIG. 9. Heat content of exhaust gases referred to ambient temperature at sea level, Model TA gas turbine.

ess heat requirements, for a total utilization of 28,210,000 Btu per hr for an overall thermal utilization of 83 percent.

There is sufficient oxygen in the turbine exhaust gases to accommodate supplementary firing up to a rate of about 65,000,000 Btu per hr, at which point the overall thermal efficiency will be approximately 90 to 92 percent.

There are many industrial applications where gas turbines can be "totally" applied for maximum profit. Mechanically, the turbine has a wide field of application for driving pumps, generators, and compressors.

Thermally, the turbine exhaust heat recovery systems are of sufficient flexibility to permit profitable application in many industries. Exhaust heat can be used for heat water or other process liquids or gases, for making steam, for drying, or a combination of several of these uses. The exhaust gas can be refired in boilers, dryers, rotary kilns, and other similar equipment. "Profitability" is a direct function the balance between power and heat requirements of each particular plant.

One of the newest "total" applications – and one that has great potential – is in the field of air conditioning. This field was discussed in a companion article, *Gas Turbines for Air Conditioning,* that appeared in the July 1959 issue of AMERICAN GAS JOURNAL.

The gas turbine has considerable flexibility in adapting to the requirements of a wide variety of industrial and commercial applications in this field. In general, it is competitive with a steam turbine-driven plant but more expensive than electric motor drive from the standpoint of initial installed cost of the complete air conditioning and heating plant.

However, analysis of costs of owning and operating gas turbine powered air conditioning plants shows that savings resulting from the use of the gas turbine will pay-out the incremental investment (over any other type of prime mover) in less than five years and afford substantial savings in operating and maintenance costs in subsequent years.

Gas turbines are also ideally adaptable for installations in which shaft power is used to generate electricity and exhaust gases are utilized in powering a steam-turbine-driven air conditioning plant. On a turn-key basis, the generating plant will cost about $200,000 and the air conditioning plant will cost about $145,000, for a total installation cost of $345,000. The plant is designed to produce 900-kw electric power and 500 tons of air conditioning. This plant will show power production at an overall thermal efficiency that is considerably higher than any other cycle of comparable size and flexibility. One shopping center installation of this type, analyzed on the above basis, shows a payout for the generating plant in the fourth year, compared to purchase of electricity for power and air conditioning.

Among other installations in which a gas turbine is operating profitably is a Bentonite processing mill in Wyoming. At this plant, Bentonite clay is dried in a rotary kiln, ground, and packaged to be used for oil and gas well drilling mud, as well as many other industrial uses.

A gas turbine installed at the plant drives a generator for plant power, and exhaust gases from the turbine are ducted directly to the burner plate of the rotary kiln. Because drying must be done at a temperature of approximately 1500 F, supplementary firing is used to raise the turbine exhaust gas temperature from 890 F to 1500 F.

Without considering the heating value of the turbine exhaust gases, the gas turbine is generating electric power at a cost of less than 6 mills per kwh. Prior to installation of this generator, purchased power cost 11 mills per kwh. Addition of this generating plant was made without increasing requirements for operating and maintenance personnel or water supply, and installed cost was lower than could have been made with other power cycles of comparable efficiency and dependability.

* * *

Strong 1959 first-half sales trend expected to continue for balance of year, through 1960 . . .

Gas Appliance Sales Continue to Climb

SUBSTANTIAL SALES GAINS reported by the gas appliance industry during the first six months of 1959 are expected to continue through the last half of 1959 and all of 1960.

Encouraged by the good showing so far this year, manufacturers of gas appliances and equipment are predicting that 1959 unit sales will exceed those of 1958 by 10 percent, and 1960 unit sales will be at least 3.8 percent above 1959's totals.

That's the consensus resulting from a mid-year survey of manufacturers conducted by Edward R. Martin, director of marketing and statistics of the Gas Appliance Manufacturers Association, for his semi-annual *General Business Outlook* report.

In the first half of 1959, Martin observes, sales of practically all types of gas appliances and equipment exceeded expectations indicated in a similar study made in December 1958.

Rate of increase in sales in the second half of 1959 over the comparble 1958 period, however, is expected o be somewhat lower than the percentge of increase reported in the first half, Martin notes. Regardless, 1959's total sales of built-in gas ranges, automatic water heaters, warm-air furnaces, boilers, and vented recessed wall heaters may reach new all-time peaks, he emphasizes.

Gas range sales expectations illustrate the industry's mid-1959 optimism. n December 1958, Martin points out, gas range manufacturers felt that 1959 sales would reach 1,883,100 units. With relatively active first half a matter of record, the consensus today is that 1959's gas range sales will total 2,054,700 units. They also expect this trend to continue through 1960, with sales reaching 2,155,600 units that year.

If all the manufacturers produce nd sell the quantities individually an- cipated, an even more optimistic prediction is in order and 1960's total may go as high as 2,276,700 ranges.

Built-in ranges, sold at the rate of 231,000 units last year, are expected to increase to 340,000 units this year and to 399,400 units in 1960. If all companies produce the number they expect to, the 1960 total could reach 421,800 built-ins.

Automatic gas water heater manufacturers predict their 1959 sales will attain a record level of 3,030,700 units and 1960 sales will reach 3,076,000 heaters. On the basis of individual company expectations, 1960 sales could go as high as 3,455,000 units.

Gas central heating equipment manufacturers, including warm air furnaces, boilers, and conversion burners, expect 1959 sales to hit a new peak of 1,317,600 units, and they anticipate 1,375,100 sales in 1960. If all manufacturers perform up to present expectations, the 1960 total could be 1,482,300 units.

Warm air furnace sales are expected to go over the 1,000,000 unit mark for the first time in 1959, and to surpass that level in 1960. Gas boiler sales, too, will reach a new high in 1959, and continue climbing in 1960.

Gas vented recessed wall heater sales this year will also reach an all-time high of 427, 300 units and increase to 440,800 units in 1960. Next year's total could be 476,400 heaters if all firms live up to their expectations.

Martin points out that the survey was made prior to the current steel strike and the duration of the strike could influence all appliances and equipment sales.

INDUSTRY UNIT SALES OF GAS APPLIANCES
For Calendar Years 1958, 1959, and 1960

	1958	1959*	1960 (Est.)	% Change 1960 over 1959
1. Domestic gas ranges				
a. Free-standing	1,665,000	1,714,300	1,756,200	+ 2.4
b. Built-ins (oven-broiler units)	231,000	340,400	399,400	+17.3
c. TOTAL	1,896,000	2,054,700	2,155,600	+ 4.9
2. Automatic gas water heaters	2,673,400	3,030,700	3,076,600	+ 1.5
3. Gas central heating equipment				
a. Warm-air furnaces	853,700	1,062,000	1,117,400	+ 5.2
b. Boilers	123,200	136,600	144,100	+ 5.5
c. Conversion burners	148,200	119,000	113,600	— 4.5
d. TOTAL	1,125,100	1,317,600	1,375,100	+ 4.4
4. Gas vented recessed wall heaters	389,000	427,300	440,800	+ 3.2
5. Gas floor furnaces	97,500	96,400	88,300	— 8.4
6. Gas direct heating equipment	1,395,900	1,421,200	1,529,600	+ 7.6
7. Gas incinerators	51,800	40,400	44,300	+ 9.7
8. Gas-fired unit heaters	115,000	124,500	131,000	+ 5.2
9. Gas duct furnaces	18,800	21,700	23,700	+ 9.2
10. Commercial gas ranges	30,600	34,200	32,300	— 5.6
11. Gas clothes dryers (individual dryers and combination washer-gas dryer units)	412,100	461,600†	499,000†	+ 8.1

*Concensus for 1959 total sales, based on manufacturers' replies to GAMA survey.

†Estimated for 1959 from data by American Home Laundry Manufacturers Association, GAMA, and other sources. GAMA mid-year survey notes that — based on limited number of replies, 1960 dryer sales to be 8.1% over 1959 volumes; this percentage extended to 1959 estimate. *Source: GAMA*

PATENT REVIEW

NEWS ABOUT NEW IDEAS FOR THE GAS INDUSTRY

Salt in Underground Storage Discharge Lines Eliminated

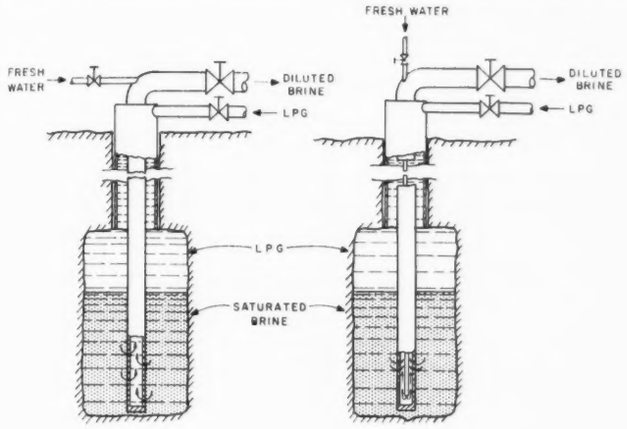
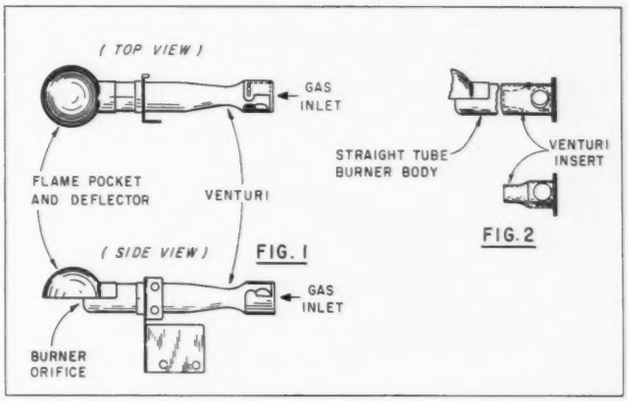


FIG. 1 Fig. 2

Two-pronged solution to problem of clogged discharge lines from underground LPG storage caverns is claimed in newly patented method. Precipitation of salt from the brine used to carve out storage caverns and displaced in the injection of LPG for storage occurs as the brine solution rises to the surface due to reduced temperature and pressure. One answer to the problem proposes injection of a clear stream of water at the bottom of the hole to dilute the brine (Fig. 2). An alternate method proposes water be injected at the surface on the horizontal section of the brine discharge pipe (Fig. 1), where frequently the salt precipitation is greater than below the surface. A backwash to clear clogging that may appear below the ground surface can be effected by closing a discharge valve. Precipitation clogging has been successfully prevented by injection of water at the rate of about 2 gal per 42 gal bbl of saturated flowing brine. *U. S. 2,869,328 (1959) Jan. 20. R. M. Gibson et al, assigned to Texaco, Inc.*

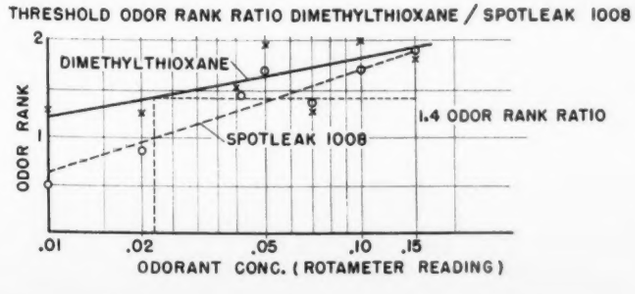
"Flame Pocket" Assures Constant Burning Despite Pressure Surges

Simplified gas burner adapted for gas-heated clothes dryers utilizes venturi inserts and flame deflector to increase efficiency of combustion and reduce likelihood of flame going out on sudden surges of gas pressure. Burner consists of a spun-metal or seamless open-end tube whose cylindrical wall converges to a reduced diameter throat or venturi near the inlet opening, then diverges to a generally cylindrical wall so contoured that the outlet or discharge orifice has a uniformly curved outlet. A flame deflector extends over the top of the burner orifice to form a shielded flame pocket that can re-ignite the burner in case the flame should be blown out by sudden pressure surges. Burner may also be made by using interchangeable venturi inserts in a simple tube. Inserts can readily adapt burner to various types of gas. *U. S. Patents 2,867,272 (1959) Jan. 6. H. E. Morrison assigned to Whirlpool Corporation.*



Odorant Has High Odor Threshold, Stable Elements

Dimethyl p-thioxane and dialkyl p-thioxane — in which various alkyl substituents of p-thioxane are of 1 to 3 carbon length — are claimed as stable odorizing agents for fuel gases such as natural gas, manufactured gas, coke oven gas, LPG, and mixed gas. Fuel gas when mixed with as little as 0.04 lb of the agent per Mcf has a distinctive odor strongly apparent to people of good olfactory perception even when gas is diluted 1 percent in air. Odorant may be mixed up to 5 lb per Mcf without causing difficulties of physical or chemical nature, such as corrosion or condensation. For ordinary purposes of leak detection, and warning of explosion hazard in fuel gas distribution lines, however, it is not necessary to exceed 2 lb per Mcf and rarely more than 1 lb. Agent is stable with oxygen and other components of commercial fuel gas; insoluble in water, and is not scrubbed out of gas by liquid water in pipelines or gas holders. Dimethyl p-thioxane is also useful in toxic fuel gases where its concentration may be maintained at sufficient level to provide warning of presence of detrimental concentration of toxicant in the atmosphere. Readily volatilized in gas streams, agent may be injected by standard odorizing methods. *U. S. Patent 2,869,994 (1959) Jan. 20. A. D. Never and Edward M. Fettes, assigned to Pennsalt Chemicals Corporation and Thiokol Chemical Corporation.*



Insulating Bar Aids In Isolation of Meter

Carl Hendrickson, *Engineer, and* **Andrew Pavesich,**
District Appliance Service Supervisor
Northern Illinois Gas Company, Bellwood, Illinois

ELECTRICAL ISOLATION OF CUSTOMER GAS SERVICE CONNECTIONS from the main is one of the major problems facing corrosion engineers in gas distribution companies.

The reason for this isolation is to break up the natural electrolytical circuit created by the electromotive force between dissimilar metals normally used in water and gas distribution systems.

This circuit (Fig. 1) is continuous as the two systems normally are interconnected through the hot water heater or boiler. Electric current will flow to the water service and main whenever the soil resistance and proximity of water and gas facility permits it. The point at which current leaves the gas facility is the spot where electrolytic attack is experienced.

If the continuity of this circuit is broken up by the insertion of an electrical insulation at some point in the circuit, the electrolytic attack is stopped. The obvious point for the insulator to be installed is inside the building or above the ground immediately before service enters the building wall. This permits protection of the entire service pipe along with the main.

Recognizing that there are many possible combinations of methods and materials used in gas system and service line construction, this article does not explore the application of service isolation to each specific case. In all cases involving metallic pipe, however, it is advisable to insulate the service at, or in, the building.

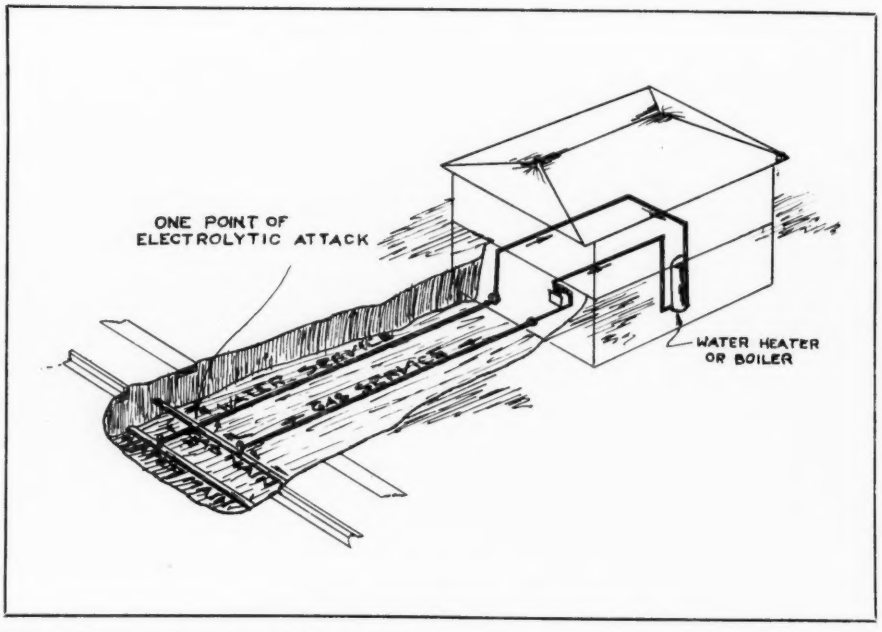


FIG. 1. Diagram shows how electrical shorting of gas and water services occurs with normal installation.

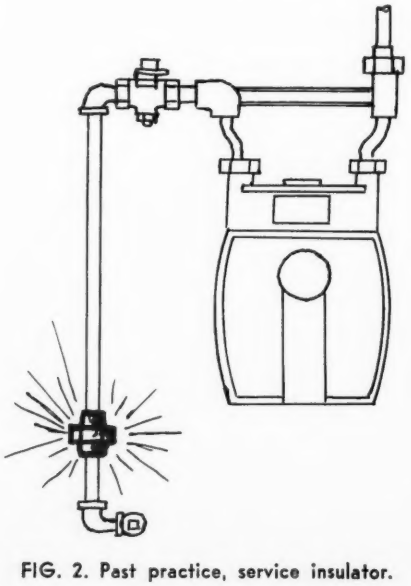


FIG. 2. Past practice, service insulator.

EDITOR'S NOTE: *The idea of using a two-thirds union at the meter bar in isolating services in customers' homes, reviewed here, won an initial award of $250 for authors Hendrickson and Pavesich, who collaborated in entering the idea in Northern Illinois Gas Company's regular employee suggestion contest. At the end of the year (1958) they also divided a $150 "top suggestion award" prize.*

Northern Illinois Gas has been engaged in cathodic protection of buried gas facilities since 1948. Since then, all new facilities have been protected by either anode or rectifier protection. The interstation supply mains were the first objective. NI-Gas now is systematically insulating and protecting its entire distribution system, town by town.

During this service isolation program, it was discovered that a substantial savings could be realized if we changed the location of the insulating union from previous company specifications.

Until this change, NI-Gas had been insulating (Fig. 2) inside the basement wall at service entrance. The theory behind this was that less pipe on the street side of the insulator became exposed. This lessened the possibility of an accidental short of the insulator if a metallic object was accidentally laid across the insulator.

Installing an insulator in this location in existing services during our pro-

Save 3 ways

with Eclipse Wedgeseal-Insulated Packages

1 Reduce installation costs

2 Get the "package" unit for less
than total cost of individual components

3 Cut purchasing costs by buying
from a single responsible source

"Packaged" Eclipse meter bar assembly (above) features Wedgeseal design integral union. Wedgeseal-Insulated gas cock (left) combines shutoff and insulation.

There's no denying that an installation designed to do a specific job is usually the best answer even if it costs a little more. But — Eclipse gives you insulated meter bar and gas cock "packages," both of which actually *cost you less* than if the components were purchased individually. Whether insulating at the meter or in the service riser, one of these Eclipse "packages" will do it better, more economically.

Because there are fewer fittings to contend with, installation is faster with resultant savings in assembly labor costs. Eclipse assumes sole manufacturing responsibility for the entire unit, thus assuring that each element is the best of its type. Long, trouble-free service is the natural result.

Wedgeseal-Insulated construction, part and parcel of both Eclipse "packages," prevents "jumping" or "shorting" across the union, is 100% effective in insulating mains and services from stray or induced house currents. The integral Zytel 105 insulator, used in compression only, eliminates shearing action, withstands 350 ft-lb torque without damage. It's form stable at 400° F, suitable for continuous operation at 275° F. Each Eclipse "package" is equipped with Neoprene gasket and individually tested at 125 psi.

Wedgeseal typifies the "know-how" and extra effort that, for fifty years, have gone into Eclipse meter bars and gas cocks. Write for additional information on features and applications.

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tection program practically necessitated rebuilding the meter set since it had to be disassembled back to the service cock on the service entrance. In addition to new fittings, this installation proved costly in terms of manhours. Finding and justifying a more efficient method seemed the answer.

Early study indicated that the meter bar union was the most obvious location for the insulating union (Fig. 3) since only a portion of each union had to be replaced. Furthermore, such a location would minimize rebuilding each meter set.

The possibility that an accidental short might be invited by such an installation was thoroughly discussed. Company fitters were questioned, and this informal survey indicated such shorts were a remote possibility.

In addition, the company's annual inspection of key anode readings should reveal the existence of shorts. These can then be traced and corrected. Annual inspection of key anode readings, incidentally, is a "must" with NI-Gas in view of the increased underground construction in progress throughout our service territory in northern Illinois.

Mechanically, the revised technique suggested and adopted involved the purchase and installation of two-thirds insulating unions (Fig. 4). This unit can be installed as a mating piece for the standard ground joint union found on all existing meter bars used by NI-Gas. This converts them into an insulating union.

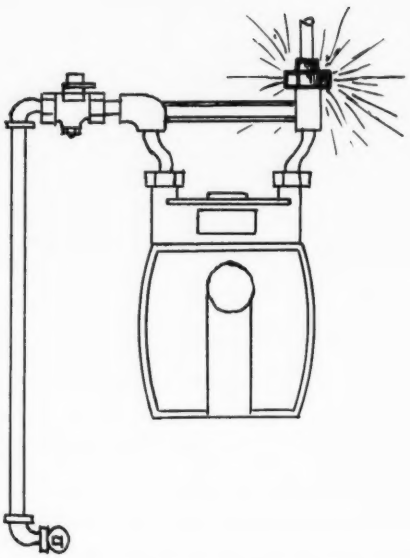


FIG. 3. Present practice, service insulator at meter bar.

Incidentally, NI-Gas has found it necessary to stock two sizes to meet system requirements.

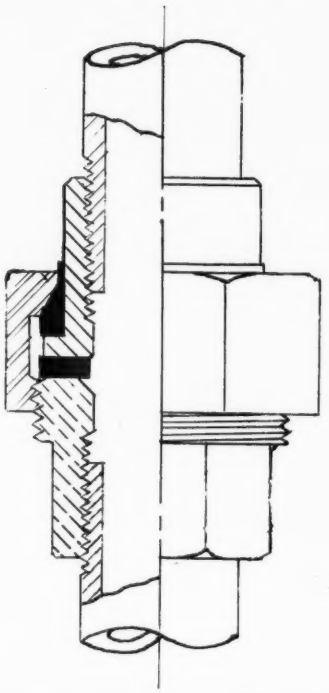
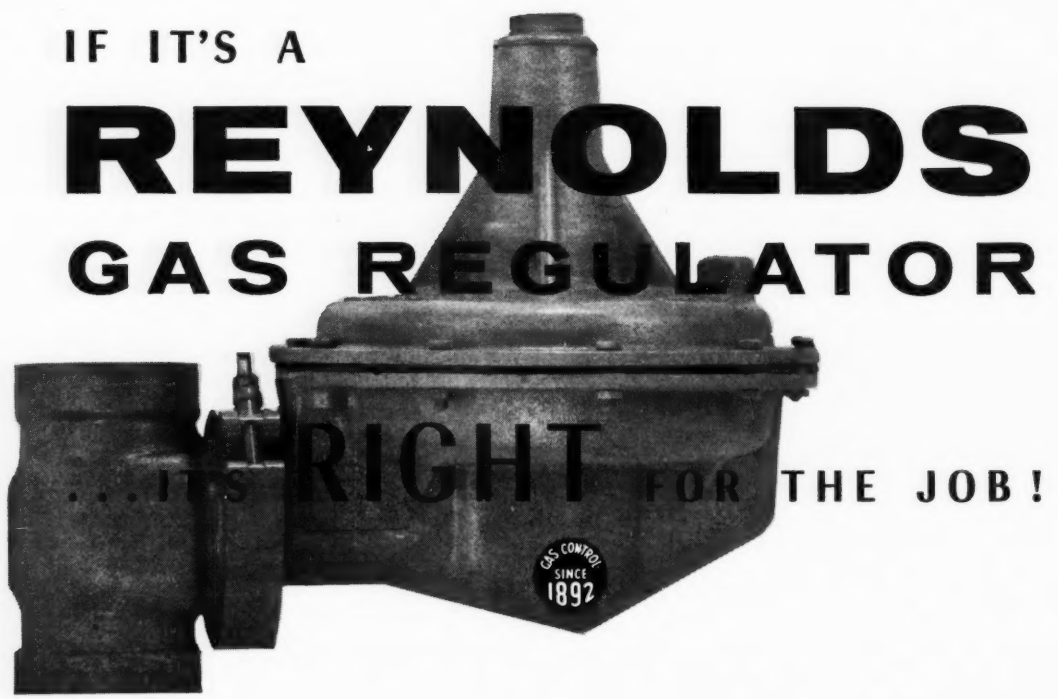


FIG. 4. Diagram shows construction of two-thirds insulating union.

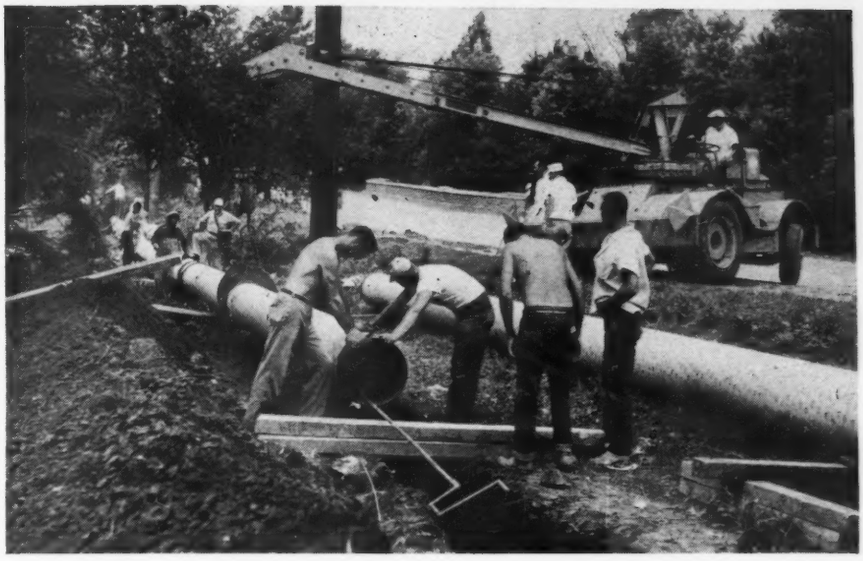
Additional field experience still is a "must" but this revised service isolation method utilizing the insulated two-thirds union at the meter bar appears to be the answer. * * *



REYNOLDS GAS REGULATOR CO., INC.

ANDERSON, INDIANA. A Subsidiary of Arkansas Louisiana Gas Company

Atlanta Gas Light Company, Atlanta, Georgia, has completed construction on two new gas distribution systems in Alpharetta and Roswell, and installation of a 6-in. line from Roswell north to Alpharetta along U.S. 19. Over 700 applications for service have been received in Roswell; and 2500 in Gwinnett County. In metropolitan Atlanta, a 24-in. belt line has been rerouted near Flat Shoals Road due to highway construction. A second 24-in. parallel line has also been installed in anticipation of future system expansion. AGL's old Cartersville tap line has been abandoned and a new tap line between Number 2 Rome station and South Bartow county completed to extend the AGL system to Shaw, Euharlee, Sylesboro, and the city of Taylorsville in Bartow and Polk counties. Service has also been extended to Pepperell Manufacturing Company village of Lindale, south of Rome, adding more than 350 customers.



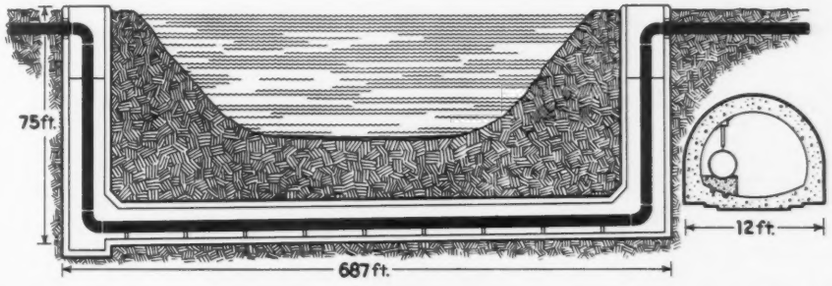
Building for the future, Laclede Gas Company of St. Louis is extending and reinforcing its vast distribution system in all directions to meet ever-increasing demands from St. Louisans for gas service. Above, crews are shown at work installing part of a 2½-mile addition of a 20-in. feeder pressure belt line main on Lindbergh Road north of Manchester, in the St. Louis area.

DISTRIBUTION DEVELOPMENTS

NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

British Columbia Electric Company, Ltd., Vancouver, Canada, has construction underway on 20,000 ft of 12-in. high pressure gas distribution line in Vancouver. Contractor is Mannix Co., Ltd. O. L. Lee is superintendent on the project. Company is completing plans to build a $7,500,000 30-in. supply line through the Fraser Valley parallel to company's existing 18-in. line. New line from Huntingdon to North Surrey will triple capacity to serve the Lower Mainland including the Burrard Thermal-Electric Generating Station, now under construction on the north shore of Burrard Inlet, and homes, business, and industries in the Frazer Valley and Greater Vancouver.

Cartier Gas Corporation, Montreal, Quebec, a wholly-owned subsidiary of St. Maurice Gas Inc. and Consumers' Gas Company of Toronto, has secured gas distribution franchises to serve Acton Vale, Farnham, and Cowansville in eastern Quebec. Other centers in which company already holds franchises include Granby, Magog, and Waterloo. Cartier proposes to build a supply line from the Montreal area through the Quebec Eastern Township, crossing the St. Lawrence River at Trois Riviers, where parent company, St. Maurice Gas presently distributes manufactured and propane gas, and ultimately along the north shore of the St. Lawrence River to Quebec City.



Artist's conception of tunnel under Calumet River being constructed for Peoples Gas, Chicago. Cross section at right shows how tunnel is designed for future expansion.

Chicagoland Gas Goes By Tunnel At Calumet

Peoples Gas Light and Coke Company, Chicago, is completing work this month on a tunnel beneath the Calumet River that will carry a new supply line some 60 ft below the busy stream. Final work on the project includes excavation and concrete pouring on the tunnel's outer shell. Already completed are 75-ft shafts on the river's north and south banks. Estimated cost of the completed tunnel is $481,000. The tunnel, which will carry one line initially, is designed to accommodate a second line for future expansion.

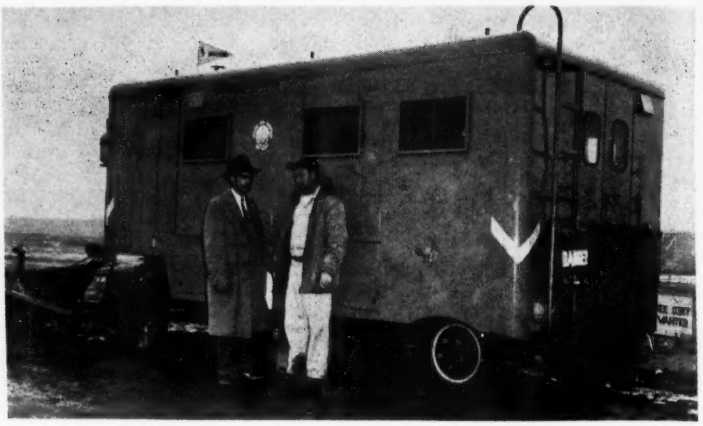
The tunnel is part of a $17,000,000 project being constructed by Peoples and its subsidiary, Chicago District Pipeline Company, known as the "Third Calumet Line." Work is expected to be completed this autumn. The 36-in., 60-mile line, with a design capacity of 557,000,000 cu ft per day, will transport gas supplies for Peoples and other Chicagoland utilities.

Peoples, Chicago's largest gas distribution utility, is installing about 10 miles of new line. Its area gas pipeline subsidiary, Chicago District Pipeline, which is constructing the 50-mile segment from Joliet to Chicago's city limits, operates two other lines in the same general area.

Part of the gas supply for the new line, up to 70,000,000 cu ft per day initially, will come from the new Midwestern Gas Transmission Company gas pipeline now under construction from Portland, Tennessee, with delivery to People's subsidiary near Joliet. Two other Peoples' subsidiaries — Texas-Illinois Gas Pipeline and Natural Gas Pipeline Company of America — also terminate near Joliet.

New Crew Shelter Trailer Studied In St. Louis

An experimental trailer designed to serve as a crew shelter and to provide storage for equipment is currently being tested in St. Louis by Laclede Gas Company's street department. The trailer is designed to accommodate crews of 8 to 12 men and contains both interior and exterior shelf space for tools, clothing, and personal belongings. It would replace tool carts, non-mobile shelters, and coke heating units now used by the utility. Shown discussing the trailer are Jack Vogel, general foreman, and Jim Farless, main foreman, both of Laclede's north district street department. Overall length of the trailer is 16 ft; overall height is 10 ft, and overall width is 7 ft, 11-in. Empty weight is 6300 lb. Wheel base is 155½-in.



S-7-L Diaphragm only, without carrier wire, brackets and gaskets

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SYNTHETIC DIAPHRAGM

- **no need to change standard parts or gear ratios**
- **no cloth lining, no fabric failure**

No other synthetic material can match the flexibility or even approach the **service-proved** performance of the Lancaster S-7-L and S-700-L diaphragms with carrier wire, brackets and gaskets attached, for Sprague 1-A Gas Meters.

Developed and improved over 7 years, Lancaster Synthetic Diaphragms have also been **laboratory-proved** — recording without failure the equivalent of 50 years of average domestic consumption per meter.

And the superior performance is built into the diaphragm itself . . . no need to change standard parts!

Other Lancaster non-crack synthetic diaphragms available are: C-1-L for #1 Ironclad and No's. O-L and 1-L for #0 and #1 Emco meters.

Every Lancaster Meter Part Deserves Your Confidence . . . They're made to last the life of the meter!

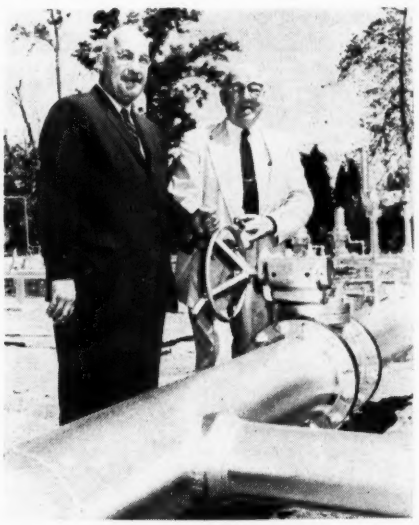
Lancaster **METER PARTS CO.**

Manufacturers of Quality Parts for Gas Meters

POST OFFICE BOX 378 LANCASTER, OHIO

Cascade Natural Gas Corporation, Seattle, Washington, has construction underway on 63.5 miles of 2 to 6-in. distribution mains. Completion date is set for January 1960. Project includes 45 miles of 2-in.; 3 miles of 3-in.; 12 miles of 4-in., and 3.5 miles of 6-in. Company recently completed other installations totalling 53.23 miles of 2 to 8-in. Company crews are making installations.

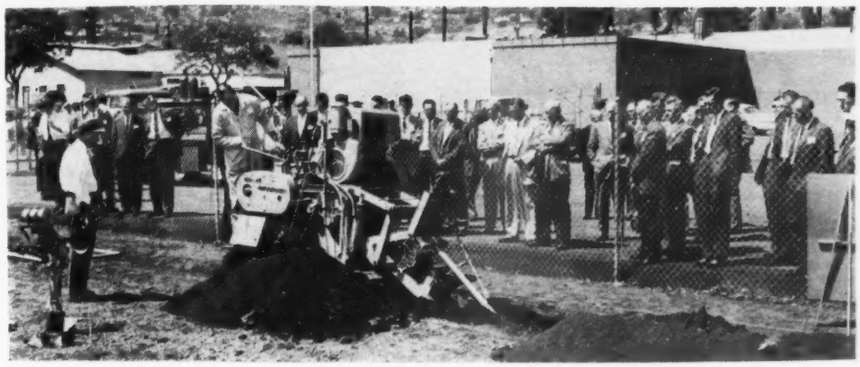
Greater Winnipeg Gas Company (formerly Winnipeg & Central Gas Company), Winnipeg, Manitoba, Canada, has construction under way on an undetermined amount of 2 to 8-in. distribution lines and services near St. Boniface, Manitoba. Contractor is Mannix Co., Ltd., R. L. Telford is superintendent on the project which is expected to continue until freeze-up.



Mayor E. S. Capps of Wilmington, North Carolina, left, and Clifford B. Ewart, president, Tidewater Natural Gas Company of Wilmington, open city gate valve to introduce natural gas to the area for the first time. Wilmington's new distribution system, built by contractor C. N. Flagg and Company, Inc., initially is serving 2000 residential customers and numerous industrial and commercial firms. Utility's goal is 10,000 customers by January 1960. Tidewater also has new systems in Fayetteville, Kinston, Washington, and New Bern, North Carolina, all installed by the Flagg organization.

Equipment Exhibit Highlights PCGA Distribution Meet

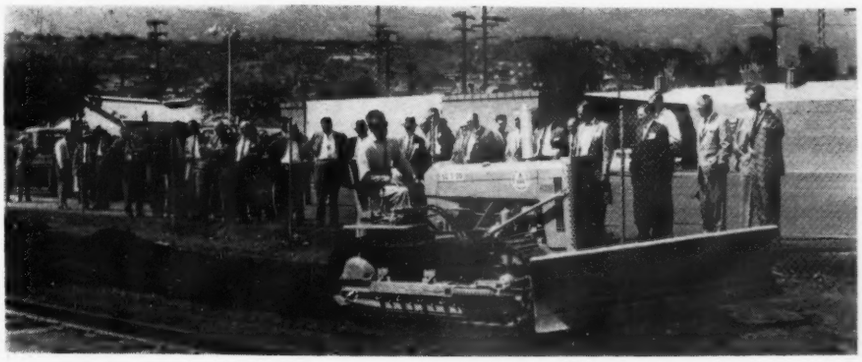
Feature of 1959 Pacific Coast Gas Association Distribution Conference in Santa Barbara, California, was display of construction and service equipment by Southern Counties Gas Company. Inspecting new service truck at the exhibit were conference officials, left to right, James Gary, Washington Natural Gas Company, PCGA operating section vice chairman; Jay Davis, Jr., Southern Counties vice president and conference sponsor; Thomas N. Banks, Southern Counties Santa Barbara division manager, and R. R. Blackburn, senior vice president of Southern California Gas Company and PCGA president.



Above, mobile trencher for small mains and service lines is demonstrated for conference delegates.

At right, portable compacting tool is put through its paces, tamping trench backfill for attentive audience.

Below, back-filler unit, a small but powerful track-type tractor equipped with dozer blade makes quick work of trench spoil.



NOW...You Can
SLASH
Trench Costs

Model M-3, 9 HP, Illustrated

Amazing Trenchers
MODELS: C-3, 7 HP • M-3, 9 or 12 HP

DITCH WITCH

Produces Low Cost Trench

. . . overall cost less than any other machine or method! Usually about 2¢ A FOOT

HOW IT'S BUILT: 7, 9 or 12 HP air cooled engine, 3-speed transmission, sealed ball bearings, 20M lb. test steel digging chain, replaceable teeth Studite edged, telescoping tubular steel boom, screw jack depth control —rugged throughout!

WHAT IT WILL DO: Trench at speeds up to 12 FPM, widths 3" to 12", depths 2' to 5', digs in any soil. Countless applications for utility service lines, gathering systems, signal systems, cathodic protection, street lighting, sprinkler systems, road crossings, etc.

CHARLES MCH. WKS., INC. PERRY, OKLA.

Distributors throughout the world sell, rent, and service Ditch Witch trenchers. Contractor's service is available everywhere at reasonable rates. For information, write, wire, or call!

Charles Machine Works, Inc.
602 Birch St., Perry, Oklahoma
Gentlemen: Please send the information checked, at no obligation.
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Address _____
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NEWSREEL

"The Miracle of Natural Gas" mural, originally featured in A. O. Smith's national advertising, has been presented to American Gas Association headquarters for its reception room. Shown at the presentation ceremonies are (left to right) Harold Massey, managing director, Gas Appliance Manufacturers Association; C. S. Stackpole, A.G.A. managing director, who accepted the painting for the association; S. E. Wolkenheim, vice president for marketing, A. O. Smith Corporation and Walter Stake, regional vice president, A. O. Smith. The painting by Robert Handley won the Merit Award for the Art Directors Club of Milwaukee.

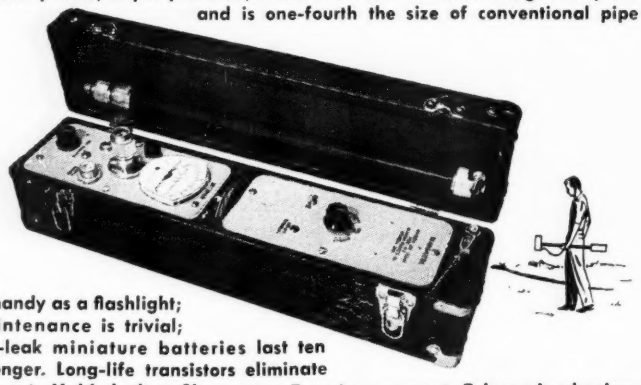
NARRAGANSETT ELECTRIC COMPANY, subsidiary of New England Electric System, has agreed to sell its Bristol and Warren, Rhode Island, gas properties to Richard A. Sullivan of Boston. Effective date of the sale depends upon approval by state and federal regulatory authorities. Two properties employ a total of 12 employees and serve 4141 customers. Earlier in 1959, gas properties in Westerly, Rhode Island, and Mystic, New London County, Connecticut, were sold and upon completion of the Bristol and Warren sale, all NEES gas properties will be concentrated in Massachusetts.

SKINNER ENGINE COMPANY, Erie, Pennsylvania, has purchased the power equipment and process machinery divisions of Troy Engine and Machinery Company of Troy, Pennsylvania including all the research, development, experimental and engineering specifications for differential pressure power units originally developed by Troy. (See article on page 31, *July 1959,* AMERICAN GAS JOURNAL.) Skinner is now in the process of expanding applications of its differential-pressure power units (expander engines) and is currently using this principle to operate power units in sizes from 10 hp to 400 hp.

WALWORTH COMPANY has organized a new French corporation to manufacture and sell valves for pipelines in France and the French colonial possessions. The new corporation, Grove-France, S.A., will be under the direct management of Marvin H. Grove, president of Grove Valve and Regulator Company, Walworth Company subsidiary.

The MINIATURIZED-PRECISION WILKINSON Line Locator Model W-3

This radically new, super-powered, transistorized instrument weighs only four pounds and is one-fourth the size of conventional pipe locators.



It is as handy as a flashlight; the maintenance is trivial; the non-leak miniature batteries last ten times longer. Long-life transistors eliminate replacement. Molded glass fibre cases. Transistor ear set. Telescopic aluminum handle. Etches circuitry and unique antenna. Contained in carrying case.

WILKINSON PRODUCTS COMPANY

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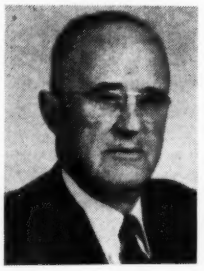
LATEST INFORMATION ON WHAT'S AHEAD for the gas industry and the nation in sales, research, management, legislation, operations, energy and supply will be presented at the A.G.A.'s 41st annual convention to be held in Chicago October 5-7. Driving home the convention theme, "New Horizons for Growth and Service" will be addresses by such men as Dr. T. Keith Glennan, Administrator, National Aeronautics and Space Administration on "New Horizons for Research"; Irwin D. Canham, editor *The Christian Science Monitor,* on "World and National Outlook," Dr. Ezra Solomon, Professor of finance, University of Chicago, who will outline "The Fabulous Sixties," and E. A. Norman, president, Gas Appliance Manufacturers Association, who will discuss future markets. Among special attractions planned for the annual convention are a 10-acre panoramic exhibit and demonstration of the newest and most modern machinery used in construction, operation, and maintenance activities in the gas industry, and a PAR research exhibit of prototype devices that are opening new horizons for utilization of gas including a model of the gas-forced-air furnace that generates its own circulating fan electricity by the thermoelectric principle.

JOHN B. SIMPSON, vice president in charge of gas operations for Consumers Power Company, has been elected president of the Michigan Gas Association, succeeding L. L. Perry, vice president and general manager of Michigan Gas & Electric Company. A. V. Brashear, vice president of Michigan Consolidated Gas Company in charge of gas operations, is the group's new vice president. Milton G. Kendrick, Michigan Consolidated Gas Company, has been re-elected secretary-treasurer.

JOHNS-MANVILLE SALES CORPORATION has appointed 3 new distributors—M. J. Crose Manufacturing Company, Tulsa, Oklahoma; E. W. Robinson Supply Company and Crutcher-Rolfs-Cummings, Inc., both of Houston, Texas—to handle the complete line of J-M fiber glass pipe wrap products and asbestos pipeline felts. Previously M. J. Crose and C-R-C had been J-M distributors for only the asbestos pipeline felts. E. W. Robinson previously handled only the fiber glass products manufactured by L.O.F. Glass Fibers Company, which recently merged with Johns-Manville.



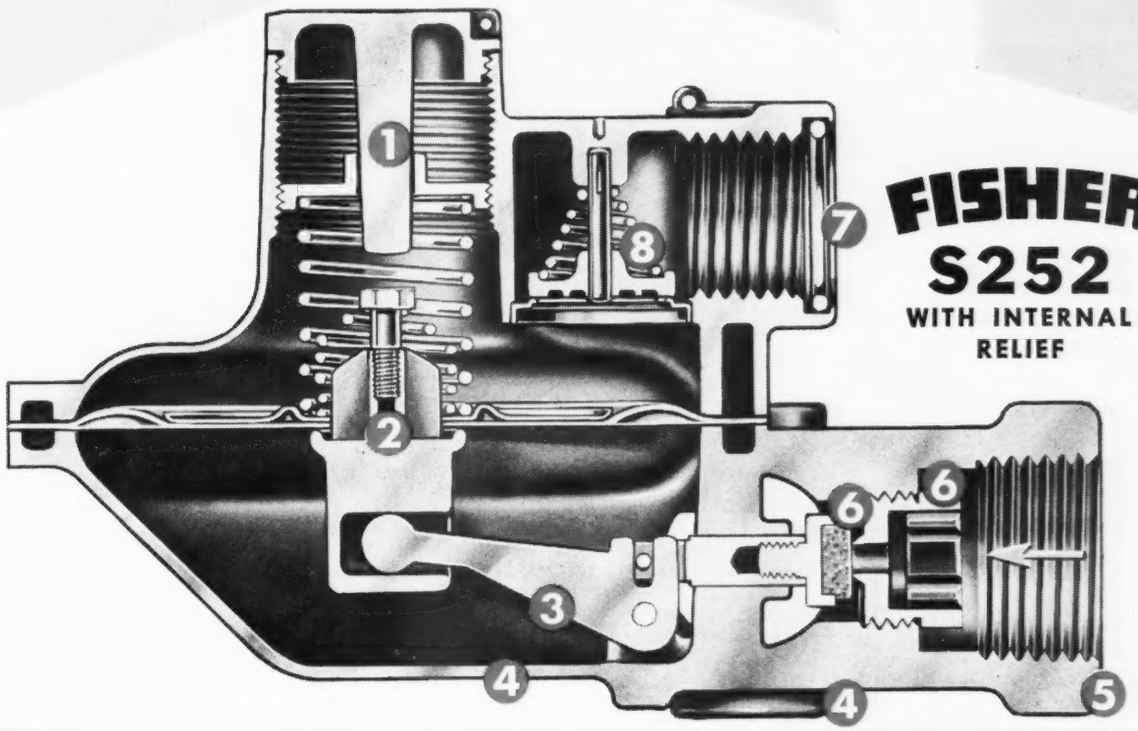
H. G. Ogburn

Paul Weber

H. G. OGBURN AND PAUL WEBER, both formerly with Grip-Tite Manufacturing Company, have, with their associates, formed a new earth and rock anchor manufacturing company to be known as Ogburn-Weber Manufacturing Company. Located in Marshall, Texas, the firm will also manufacture all types of welding saddles, cast iron river weights and other similar specialties.

This popular house service regulator handles 99% of all domestic installations

costs less initially • *costs less to install*



FISHER S252 WITH INTERNAL RELIEF

1. Emergency relief valve post for positive opening action (patent pending).
2. Full capacity internal relief valve (exceeds code requirements).
3. Rugged, precision-machined internal parts.
4. Aluminum body and casings for strength, easy handling, low shipping costs.
5. Elbow-type body for installation economy.
6. Both valve disc and orifice are renewable through inlet.
7. Full size ¾" weatherproof monel screened vent for high capacity relief (four primary positions available).
8. Spring-loaded nylon check valve, stainless steel seat.

Available Also With Integral Meter Bar For 6" Centers to Meter.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY...

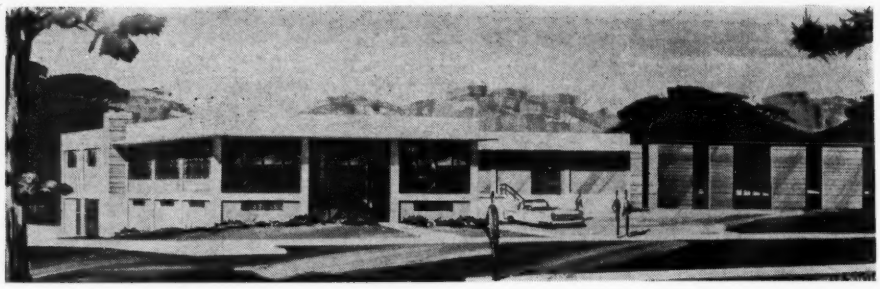
FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

BUTTERFLY VALVE DIVISION: CONTINENTAL EQUIPMENT CO., CORAOPOLIS, PENNSYLVANIA

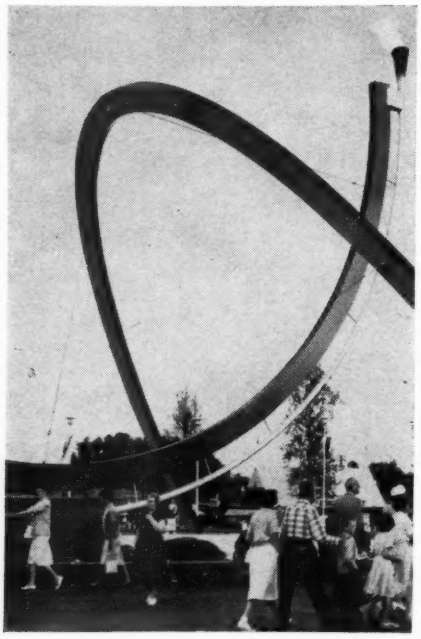
FISHER® Controls

SINCE 1880



The Gas Service Company's new $225,000 service center facilities, now under construction at Topeka, Kansas, will provide approximately 21,500 sq ft of floor space for engineering and construction offices, a gas distribution control center, warehouse, appliance stockroom and repair shop, and meter shop. A second unit—vehicle and equipment building—is scheduled for completion November 1 and will house approximately 50 trucks and wheeled construction vehicles. Site of the two new structures will be the present company location at the northeast corner of First and Quincy.

W. C. PIERSON, general superintendent of gas operations, Philadelphia Electric Co., is the new president of the Pennsylvania Gas Association succeeding C. M. Swan, Pennsylvania Gas Management Co. Other new association officers include: First vice president, E. H. Smoker, president, United Gas Improvement Co.; second vice president, John E. Geesey, president, York County Gas Co.; third vice president, Leonard B. Richards, vice president, United Gas Improvement Co.; and secretary and treasurer, J. A. Schultz, division accounting manager, the United Gas Improvement Co. Four new members elected to the governing council of the association include John W. Carroll, Philadelphia Electric Co.; William J. Foster, Geo. D. Roper Sales Corp.; John L. Harrison, Lancaster County Gas Division, U.G.I.; and Mervin P. Stermer, York County Gas Co.



Honoring Oregon's Centennial, is Northwest Natural Gas Company's "pyrohedron" at the Centennial Exposition in Portland. Flame at the top of a 60-ft pinnacle can be seen for miles around. Two laminated wood arches held in balance with cables lift the funnel-shaped burner toward the sky. A double cone of stainless steel protects the flame from winds. One minute out of every four the bright flame roars up to a crest of 10 to 15 ft and serves as a beacon for the show.

HUNDRED YEARS OF GAS SERVICE in Hannibal, Missouri will be completed in October of this year. Present owner, Citizens Gas Company, notes that original service was for gas lighting. Manufactured gas was turned into newly laid cast iron mains in 1859 by Hannibal Gas Light and Coke Company, operating under a 30-year franchise granted Major Thomas Harris and associates in December 1858. The original agreement was to furnish and install 40 street lights at $30.00 each, furnish gas at $3.00 per 1000 cu ft, and to light daily, shut off daily, and maintain the lights for $7.00 per light year. Changeover from coal gas to natural gas was made in 1931. E. D. V. Dickey, present secretary and manager, took over operations in 1920.

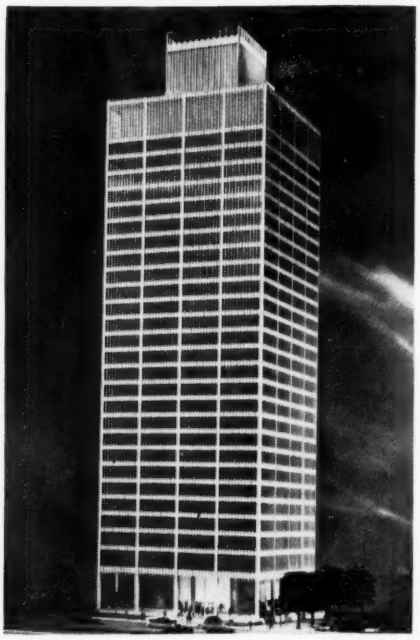
NORTHERN ONTARIO NATURAL GAS Company, Ltd., has distributed a comprehensive code of installation regulations governing installation of natural gas-fired equipment to more than 1400 dealers, installers, distribution inspectors, and utility personnel from the Manitoba border to Simcoe County, the area served by Northern Ontario and its affiliate, Twin City Gas Company, Ltd. Codes are divided into two manuals, a 84-page manual applying to equipment up to 400,000 Btu per hour, and a 220-page manual covering large volume equipment. Code complements existing rigid rules of the Canadian Standards Association B-149 manual and the Ontario Fuel Board.

WELBILT CORPORATION, national manufacturer of gas ranges, has acquired Wedgewood-Holly Corporation, West Coast manufacturer of gas ranges. Acquisition will enable Welbilt to market its products and those of Wedgewood-Holly on a national basis. Wedgewood-Holly manufacturing facilities are located in a modern 300,000 sq ft plant in Culver City, California.

TENNESSEE GAS TRANSMISSION COMPANY has acquired all the outstanding common stock of East Tennessee Natural Gas Company of Knoxville, Tennessee, through an exchange of stock of the two firms. East Tennessee is a transmission company whose lines extend east from two tie-in's on a TGT line, across the state of Tennessee to Chattanooga, and northeast along the Tennessee River-French Broad River to Bristol. Company serves 30 distribution systems including Bristol Gas Corporation, Chattanooga Gas Company, Volunteer Natural Gas Company, and numerous municipally-owned gas systems and numerous industrial customers.

FORMER CUSTOMERS OF BROOKLYN BOROUGH Gas Company recently absorbed by Brooklyn Union Gas Company, will realize a sizeable reduction in the cost of their gas as a result of the New York Public Service Commission's approval of Brooklyn Union existing rate schedules. Annual savings of more than $600,000 are expected, with the bulk of the reduction—$543,700—to go to residential customers. In general, reductions will range from 5 percent for small gas usage up to 20 percent for large quantities. Brooklyn Borough provided natural gas to more than 103,000 customers in Coney Island, Sheepshead Bay, and parts of Bensonhurst, Midwood, and Ulmer Park.

FOR THE FIRST TIME SINCE 1946, Peoples Gas Light and Coke Company has been able to offer space heating to all applicants on its waiting list of single family dwellings and in two apartment buildings. Authorization letters were mailed to some 16,500 applicants in August. Applicants accepting the service will have until May 31, 1960, to install heating equipment. With the extension, Peoples Gas will have offered space heating service to 92,000 Chicago applicants in one and two family occupancy groups during 1959. Latest extension is possible through availability of increased gas from underground storage reservoirs operated by the company.



Architectural details of Michigan Consolidated Gas Company's new Detroit Civic Center office building have been announced with the unveiling of a 7-ft scale model of the proposed $20,000,000 structure. Equivalent to 32 stories, the new gas company headquarters building will include 28 floors in the main shaft topped by a four story crown. Top two stories of main shaft are to be encased in concrete grill work. Lights playing on the wall behind the grill will silhouette its design; colored lights used to illuminate the crown can be changed to indicate the weather forecast. Work on foundations is planned for the spring of 1960, with superstructure work to get underway in the summer. Entire structure is to be completed by 1962. One of the most unusual features of the building is the six-sided window design. Shaped like an elongated hexagon, the windows will be encased in stainless steel frames that reach from floor to ceiling.

Mrs. America of 1960 is tall, stately Mrs. Margaret Priebe, a 36-year-old homemaker of Des Moines, Iowa, and mother of four children. During the coming year she will tour the nation appearing at home shows, conventions, civic functions, women's clubs, department stores, and expositions as Ambassadress of Good-Will for the gas industry.

GLAMORGAN PIPE & FOUNDRY COMPANY, Lynchburg, Virginia, one of the nation's oldest manufacturers of cast iron pipe and fittings, has created a new plastics division to manufacture and sell rigid polyvinyl chloride pipe. A new extrusion plant to produce PVC pipe in Lynchburg began production in late August. William E. Enright has been appointed sales director for the new division.

SYSTEMS SPECIALIST

Nationally-known management consulting organization needs man with BBA or BS in accounting to work with clients throughout U.S.A. and Canada. Minimum of 3 years experience in public utility accounting and/or systems methods and procedures required. Send resume and salary requirement in first letter. Replies confidential. Box Number 213, The American Gas Journal, P. O. Box 1589, Dallas, Texas.

CORROSION TECHNICIAN

Natural gas utility operating in Texas, New Mexico, Arizona and Colorado needs staff corrosion technician with minimum of two years experience as corrosion technician and capable of designing cathodic protection installations, both sacrificial and rectifier anodes, to initiate protection program in El Paso, West Texas, and Carlsbad districts. Age 26-40. Headquarters in El Paso. Travel required. Car furnished. Please include complete resume of qualifications in application and mail to:

Southern Union Gas Company
Burt Building
Dallas, Texas
Attention: Mrs. Mary Z. Hamilton

ENGINEER WANTED

Gas Promotion Engineer — Engineering degree or suitable experience including at least two (2) years experience in industrial, commercial and central house heating, air-conditioning and miscellaneous appliances, covering gas sales, engineering, supervisory installation and service. Must be thoroughly experienced in preparing heating and air-conditioning surveys and selling gas equipment for the promotion of gas sales, on the Northwest Gulf coast of Florida. Starting salary, $452 ranging to $544. Send full resume to Box 212, American Gas Journal, P. O. Box 1589, Dallas, Texas.

1959 INDUSTRIAL GAS SCHOOL, scheduled for September 14-18 in Pittsburgh, Pennsylvania, will be A.G.A.'s sixth such school. Lecture topics on the agenda of interest to gas sales engineers include techniques of effective sales approach, making and employing and adequate plant survey, gas-air proportioning and mixing systems, equipment and processes of heat treatment of ferrous and nonferrous metals, gas engine applications, luminous wall furnace application, and industrial area development.

GAS INDUSTRY'S 11TH ANNUAL ACCIDENT PREVENTION CONFERENCE, slated for September 15-16 in Atlanta, will be co-sponsored by the A.G.A. accident prevention committee, and Southern Gas Association's accident prevention council. Special feature of the 2-day conference will be a workshop for corporate officers on the theme "Top Management Looks at Accident Prevention." Both A.G.A. company safety awards and the A.G.A.-National Safety Council sponsored National Fleet Safety Contest awards will be presented.

THE FIRST PAPER INDUSTRY HEATING AND DRYING SYMPOSIUM sponsored by the A.G.A. and the Ohio Section of the Technical Association of the Pulp and Paper Industry, will be held September 15 in Middletown, Ohio. Package boilers in the paper process industries, supplemental drying through radiant heat, process air conditioning for paper converting operations, and direct gas drying of inks and adhesives are among program topics.

GAS INDUSTRY CORROSION ENGINEERS will join contemporaries in other industries in three widely separated cities during October as a part of the regional conferences set up by the National Association of Corrosion Engineers. Technical committee meetings will garner a lion's share of attention at the conclaves, with 15 committee meetings slated during the NACE south central region conference in Denver, October 12-15. In Baltimore, October 5-8 at the NACE northeast region conference, committees on pipeline corrosion and cathodic protection and corrosion in heat exchangers will meet. Calendared for October 20-22, in Cleveland, Ohio, during the NACE north central region conference, is NACE technical committee T-2L on wax-type pipe coatings and component wrappers.

NATURAL GAS DISTRIBUTION COMPANY COMMON SHARES were 18.1 percent higher in July than a year earlier. Average dividends of $1.64, were up 6.5 percent on a year-to-year basis, to yield a return of 4.08 percent to stockholders, A.G.A. reported in its monthly summary of data compiled weekly by Moody's Public Utilities.

CONSTRUCTION CONTRACTS IN FIRST HALF OF 1959 set an all-time record, with large increases in residential and non-residential building offsetting declines in heavy engineering, according to F. W. Dodge Corporation. Total contracts reached a remarkable $18.9 billion, some 12 percent ahead of the same period last year. Keeping construction at very high levels has been the residential building, with contracts amounting to $8,884,000,000, a sharp gain of 37 percent over last year. Number of dwelling units increased 35 percent, with both single family houses and apartments rising substantially. Entire gain in residential construction has been in the private construction—up 41 percent—in contrast to 20 percent drop in public housing.

AL-250

ALUMINUMCASE METER

1. SLOW-SPEED OPERATION
2. SUSTAINED ACCURACY
3. LIGHT WEIGHT

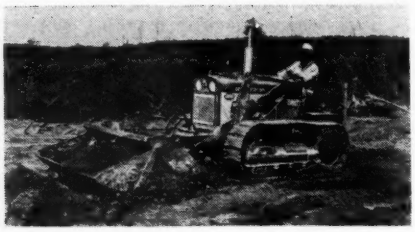
- American® AL-250 Aluminumcase Meters operate at only 7 revolutions per cubic foot providing ample power, greater accuracy and longer life.
- Molded, 3-convolution Duramic diaphragms for all fuel gas services.
- Light weight, high impact strength, die-cast aluminum alloy body reduces shipping, handling and setting costs.
- Easy reading vented index box for full index visibility.
- Rated capacity 250 cfh of 0.60 sp. gr. gas at ½-inch w.c. differential — 5 psi working pressure.

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

General Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

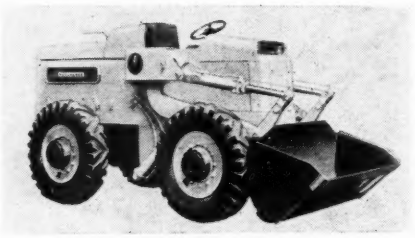
PRODUCT PARADE

MATERIALS – EQUIPMENT – SERVICES



INTERNATIONAL DROTT 4-in-1 SKID-SHOVEL — an extra rugged front end loader that duplicates actions of 4 specialized machines — has been adapted for use on the International Harvester T-340 crawler tractor. Segmented-type bucket can be used as a standard bucket, bulldozer, carry-type scraper and clamshell. Selection of action is made from the tractor seat by means of a machine selector lever, and changeover from one tool to another takes only seconds. Skidshoes mounted beneath the bucket serve as a fulcrum for strong pryout action enabling the unit to work in tough or frozen soil as well as being able to pry out stumps, boulders, old foundations, concrete pavement, and other heavy and deeply imbedded materials which sheer lifting force of ordinary buckets is not great enough to handle.

CIRCLE (1) ON THE REPLY CARD

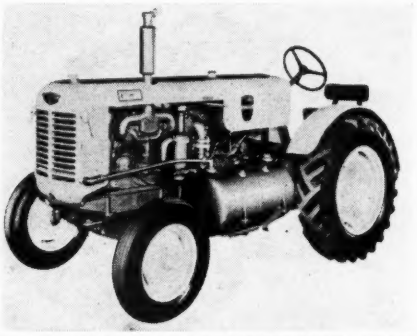


FRANK G. HOUGH COMPANY'S new model H-50 4-wheel-drive, rubber-tired tractor shovel has a 5000 lb carry capacity and will replace the Model HU "Payloader." Features of new model include more power available for both hydraulics and traction, more efficient torque-converter, complete power-shift transmission, power-transfer differentials, power-steering, pryout bucket action, safety boom arms, power boosted brakes and numerous refinements. New gasoline or diesel engines provide from 90 to 92 hp. Torque-converter, closely matched to engine and transmission characteristics, is a single-stage, 2-phase converter with a torque-multiplication factor of 2.57 to 1 at stall. Power-shift transmission provides 3 speeds in each direction; finger-tip shifting up or down in either direction, without "foot-clutching" or stopping for a range shift, gives fast operating cycles.

CIRCLE (2) ON THE REPLY CARD

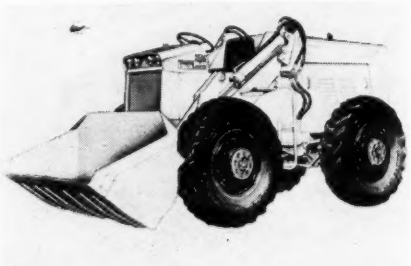
ELECTRONIC SYSTEM FOR automated data retrieval is to be marketed by General Precision Laboratory, Incorporated, and the Filmsort Company. System operates within seconds after dialing a code number on a telephone-type device to select one file card out of thousands or millions. Automatic equipment can be activated by punched cards, or by punched or magnetic tape as well as by electronic dialing. New system provides industry, institutions, and government agencies with completely mechanized means of retrieving and examining filed records of all types. Combined with closed circuit television, a high resolution image of the selected record, drawing, patent, or ledger sheet can be transmitted to a TV screen at the executive's desk. With this arrangement, file documents can be viewed simultaneously by any number of persons at various locations nearby or remote from the files. Filmsort aperture cards with microfilm inserts allow the remote-control-filing-system to transmit records as large as 36 by 48 in. In addition, system can also automatically remove records from the files and position them in devices to print back the desired information from either microfilm or standard cards. Other techniques permit viewer operator, located far away from centralized files, to update posted data on the selected card and return it to its proper file position.

CIRCLE (3) ON THE REPLY CARD



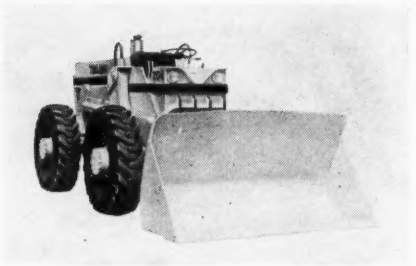
NUMEROUS ENGINEERING AND DESIGN CHANGES have been incorporated in the LeRoi 125 Tractair, combination tractor-air compressor unit, to improve maintenance and increase operating efficiency. A single-stage, piston-type compressor built integrally with a 42-hp engine, provides 125 cfm of free air compressed to 100 psi — sufficient air power to run 2 heavy or 3 medium breakers, one medium or 2 light sinkers, one light wagon drill, or a number of smaller tools, including paint spraying equipment. Combination unit can travel from job to job at speeds of 15 mph.

CIRCLE (4) ON THE REPLY CARD



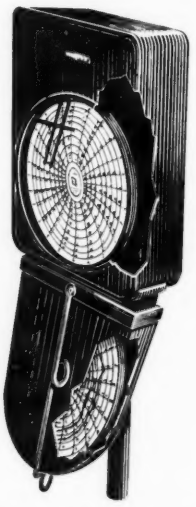
ALLIS-CHALMERS' new model TL-16 TractoLoader, is especially designed for speeding excavating loading work on construction jobs. Unit weighs 18,000 lb, and has a carrying capacity of 7000 lb. Five rugged buckets, ranging in size from 1½ to 4 cu yards are available for use with new unit. For rapid loading, buckets tip back 40 deg at ground level. For additional stability while traveling, buckets tip back at an angle of 45 deg when at carry height (14 in. above the ground). Depending on bucket size, dumping clearance under the bucket cutting edge ranges from 8 ft-½ in. to 9 ft-3-in. Top travel speed of unit in either forward or reverse is 27 mph.

CIRCLE (5) ON THE REPLY CARD



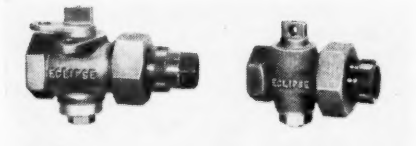
TROJAN'S NEW 2-CU-YARD CAPACITY tractor shovel with a lifting capacity of 12,000 lb is now being placed in national distribution. New functional design of the 4-wheel drive tractor shovel affords stability as well as a high degree of maneuverability. Selection of buckets of 1½, 2, and 2¾ cu yard capacities are available as well as a full complement of attachments readily interchangeable with the bucket.

CIRCLE (6) ON THE REPLY CARD



AUTOMATIC CHANGING OF CIRCULAR RECORDING CHARTS is now possible with new patented device from Maeder-Squier Company of Dallas. Called the "Automatic Meterman," method affords utilization of as many as 40 circular charts in a single recorder; disengages the charts, one by one, at virtually any desired time/date frequency, and drops them by gravity into a self-contained storage box. Device uses only a minute portion of available clock power; is designed for use on all standard recorders using circular charts of any diameter or thickness.

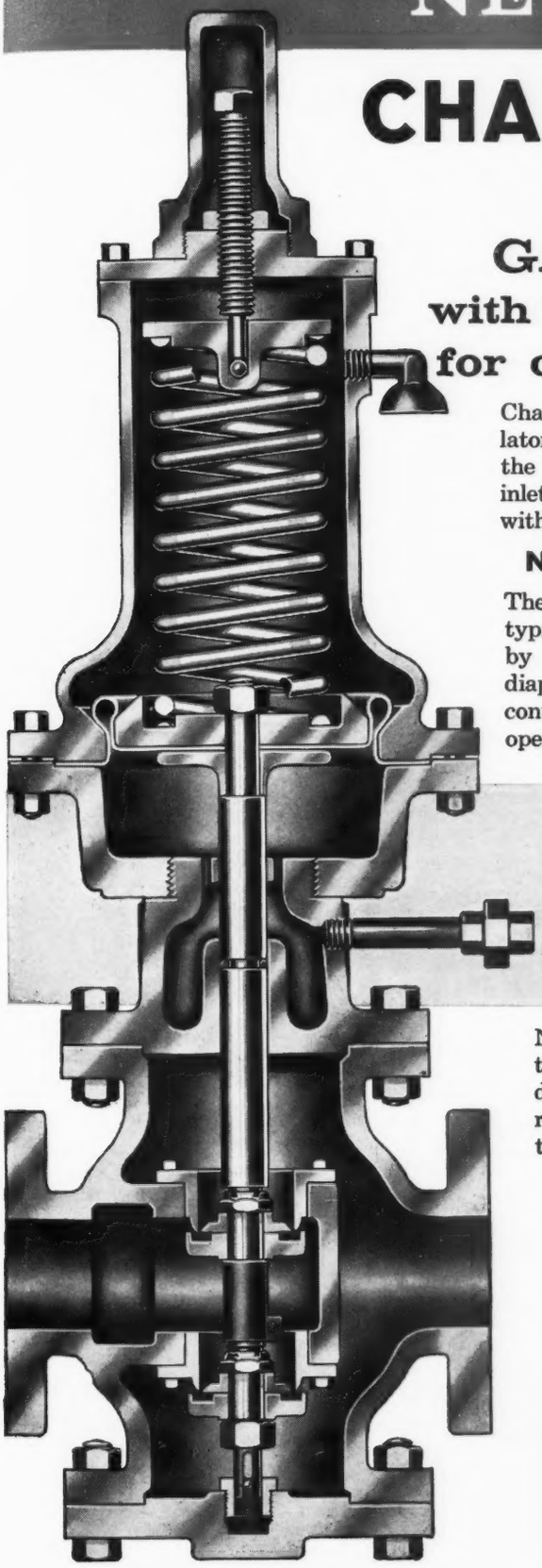
CIRCLE (7) ON THE REPLY CARD



WEDGESEAL INSULATED GAS COCKS are now available for all types of installations from Eclipse Fuel Engineering Company. The iron body brass core gas cocks with male or female thread union ends combine a long-lived shut-off with effective means of insulating mains and services from stray or induced house currents. Units eliminate coupling and nipple in almost every installation and result in lower initial cost, reduced make-up time, and fewer threaded connections. Available in ¾, 1, and 1¼ sizes in either standard or tamperproof construction.

CIRCLE (8) ON THE REPLY CARD

NEW IN PRINCIPLE!
NEW IN DESIGN!



CHAPLIN-FULTON

Model 57-S

GAS REGULATOR

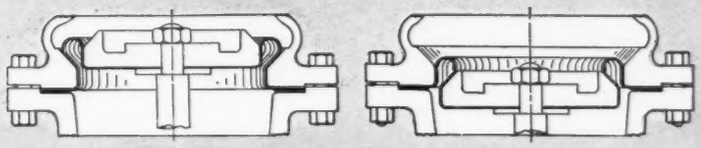
with "ROLL-OUT" Diaphragm for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

NO "FALL-OFF" AS FLOW INCREASES

The drooping characteristics or outlet pressure "fall-off", typical of conventional spring regulators, is eliminated—not by using an uncontrollable velocity effect—but by a new diaphragm design which actually reverses the action of a conventional diaphragm. It changes its area as the valve opens to compensate for the loss in spring loading force.

"ROLL-OUT" DIAPHRAGM PRINCIPLE



VALVE CLOSED VALVE OPEN

Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

2" - 3" - 4" - 6"

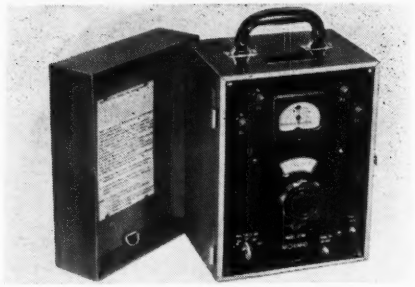
Write for Bulletin 57-S

ACCURATE CF MFG. CO. DEPENDABLE

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania



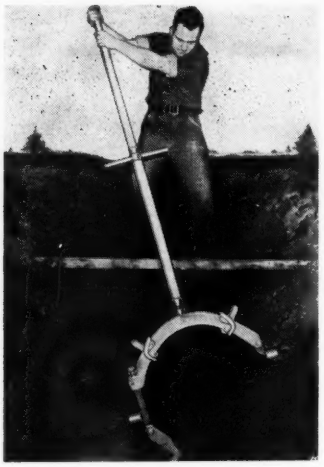
SOILS SURVEY INSTRUMENT manufactured by Associated Research utilizes the Barnes Layer Method to derive through earth conductance, sub-soil contour profiles which clearly indicate locations, depth, and type of soil layers. Data secured by these sub-soil surveys may be used to eliminate costly preliminary test borings. Unit is portable, weighs only 20 lb, and may be readily operated by one man.

CIRCLE (9) ON THE REPLY CARD

SOLVENT WELD Repair Clamp developed by Kraloy Plastic Pipe Company provides a fast, easy method for "in-the-field" repairs of PVC plastic pipe. One man can quickly repair a pipe break. "Hot" repairs on intermediate pressure gas lines as well as lines carrying liquid are easily made. PVC plastic "half-soles" for special size stock, are applied with solvent-weld and clamped until "set." When half-soles are "set," the repair is complete and the welded section becomes as strong as original pipe.

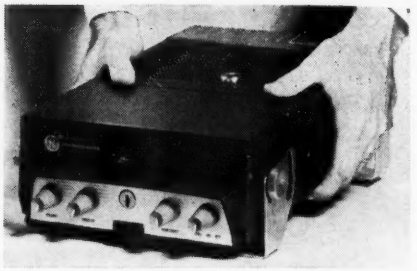
CIRCLE (10) ON THE REPLY CARD

EASY PORTABILITY, fast one-man operation, and clean accurate cuts are features of line of new rotary 4-wheel pipe cutters designed for large steel and cast iron pipe from 12 to 24 in. Developed and field tested by Reed Manufacturing, the pipe cutter consists of a separable circular frame joined at the mid-sections by hinged screws and adjusting nuts. An aluminum handle is placed successively over 8 lugs on outside of the frame and the same handle is used to tighten cutter as cutting proceeds.



CIRCLE (11) ON THE REPLY CARD

ADVANCED DESIGN TRANSISTORIZED 2-WAY RADIO EQUIPMENT that contains the highest powered transistorized models, the smallest sizes, and the lowest battery drain ever made commercially available in the mobile communications field, has been unveiled by General Electric. Designated the Transistorized Progress Line, units will be available up to 75 watts. Compact size allows units to fit better under dash of a car, and leave more leg room for the front seat. Entire assembly is made of modules that plug into each other. First units will be manufactured for use in the 150-174 mc.



CIRCLE (12) ON THE REPLY CARD

INTEGRATION of machine accounting and wire communications is now possible with the development of an advanced intercoupling system by Systematics, Inc. New equipment permits automatic transmission of punched card data at 60, 75, or 100 words per minute between locations linked by wire systems; is applicable to any operation where punched card data must be relayed to a control location for recording and analysis. System includes an input intercoupler that reads punched card data and activates a teletype transmitter; then, as data are received by a teleprinter in another location, an output intercoupler automatically activates a card punch. The output card duplicates or ignores transmitted information according to programming requirements.

CIRCLE (13) ON THE REPLY CARD

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Full Standby or Peak Shaving
Simple — Accurate — Rugged — Reliable
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SAFETY GAS MAIN STOPPER CO. INC.

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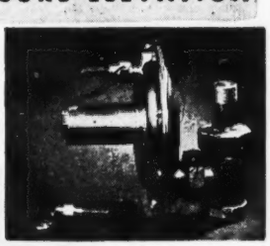
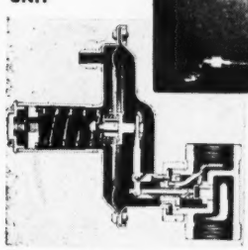
GAS SERVICE REGULATORS FOR CONVERSION OR PRESSURE ELEVATION

A REGUATOR, BREATHER VENT AND CATHODIC INSULATOR IN ONE PACKAGED UNIT





U. S. Patent No. 2,577,480. Other Patents Pending.

TYPE 51-R FOR EVERY INSTALLATION

EXCLUSIVE FEATURES NOT FOUND ELSEWHERE

Exceptionally high relieving capacity obtained by new type internal relief valve. Remarkable by-pass check valve prevents over-shooting of low pressure and damage to meter.

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UNIVERSAL

CONTROLS CORPORATION

P. O. Box 13122

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WITH

AMERICAN® WELDED STEELCASE METERS

- Tinned Steelcase Accuracy
- Hardcase Durability
- Maintenance Economies

American Welded Steelcase Meters provide a new approach to the economics of meter maintenance and retirement. Major repairs are eliminated. Minor adjustments are easy to make — assuring long service life at lowest maintenance costs.

Ask your American Meter representative for full details about Welded Steelcase Meters and their many advantages for all fuel gas services.

W-75	Rated cap. 75cfh — FOB Philadelphia
W-175	Rated cap. 175cfh — FOB Fullerton, Cal.
W-210	Rated cap. 210cfh — FOB Philadelphia
W-250	Rated cap. 250cfh — FOB Philadelphia
W-300	Rated cap. 300cfh — FOB Philadelphia
W-45-LPG	Rated cap. 45cfh* — FOB Philadelphia
WC-45-LPG	Rated cap. 45cfh* — FOB Philadelphia

*propane

Rated capacities at ½-inch w.c. differential with 0.64 sp. gr. gas — 5 psi working pressure.

AMERICAN® METER COMPANY

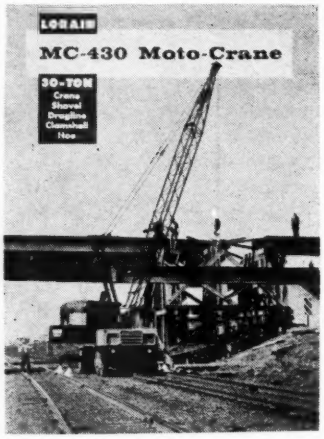
INCORPORATED (ESTABLISHED 1836)

General Offices: Philadelphia 16, Pa.

Sales offices in principal cities

BULLETIN BOARD

CATALOGS – BROCHURES – TECHNICAL DATA



DETAILS OF THEW SHOVEL COMPANY'S new 30-ton model Lorain Moto-Crane are described in new colorful 12-page bulletin. New model features 3 position turntable mounting, 8 wheel power brakes, and rocker beam front bogie design. Some turntable features shown are hoist drums on anti-friction bearings, 2-lever "joy stick" air controls, and shear-ball mounting. Boom is of Lorain's square-tubular-chord design with power load lowering and tilting gantry. "On-the-job" illustrations are also included.

CIRCLE (61) ON THE REPLY CARD

HEAVY-DUTY ATTACHMENTS to expand the work-capacities of J. I. Case utility crawler tractors are described in new 2-color, 4-page catalog. Direct-mounted tools for crawler-loaders, bull-dozers, and drawbar tractors include 5-tooth hydraulic scarifier, 5-ton winch and fairlead, and front pull hook. Protective guards against rock, snow, and timbering hazards, optional grousers and counter-weights for various footing and work conditions are also shown.

CIRCLE (62) ON THE REPLY CARD

MANGANESE WROUGHT IRON, a specialty engineering metal possessing resistance to corrosion and impact at low temperatures, is described in a new 8-page booklet available from A. M. Byers Company of Pittsburgh. Booklet contains charts showing metal's improved impact resistance at sub-zero temperatures; also discusses working properties, availability, and the new metal's suitability in low temperature services where possibility of brittle failure poses engineering and design problems.

CIRCLE (63) ON THE REPLY CARD

MANUFACTURE OF STEEL LINE PIPE ranging in size from ½ through 36-in. is described in new 40-page booklet published by Kaiser Steel Corporation. Booklet is divided into sections each dealing with 1 of 3 types of line pipe — continuous weld pipe ranging from ½ through 4-in.; electric resistance weld pipe in diameters from 2½ through 18-in.; and electric weld pipe from 20 through 36-in. Each section includes descriptions, pictures, and flow diagrams showing manufacturing sequence of each type of pipe. Line pipe data tables show weight per foot, wall thickness, test pressures for API 5L and API 5LX, and tons per mile.

CIRCLE (64) ON THE REPLY CARD

CATALOG DESCRIBING SCRUBBERS, separators, mist extractors, and purifiers is now available from V. D. Anderson Company. New 8-page catalog pictures and gives specifications and operations of 13 Hi-eF purifiers including line types for entrainment removal service in pipelines, receiver types designed for extremely large slugs of liquid, high pressure types capable of withstanding pressures up to 15,000 psi, exhaust heads for cleaning exhaust gases and vapors discharged to atmosphere, internal types for evaporator and boiler service and small line types for keeping moisture and dirt from damaging pneumatic tools. Guarantees, code information, typical installation drawings and other engineering data are given for each unit.

CIRCLE (65) ON THE REPLY CARD

DISCUSSION OF PACKAGED FIRE-TUBE BOILERS — from construction features to final test and start-up service — is highlighted in new 12-page 4-color brochure prepared by Cleaver-Brooks Company. Bulletin covers package boilers through 600 hp for heating and processing, steam or hot water. Current design trends, burner design, automatic operation, efficiency ratings, and factory tests are discussed.

CIRCLE (66) ON THE REPLY CARD

CONTROL SYSTEMS for completely automatic operation and protection of gas-engine compressors are described in new bulletin from Ingersoll-Rand Company. Typical installations of "Tenda-matic" control as it is applied to engine-compressors for gas distribution, oil and gas field services, and other compressor applications are described. Included among the functions that can be performed are automatically-timed steps for starting procedure, speed and capacity regulation, constant guarding of unit against malfunction, normal shutdown control, and sequence control.

CIRCLE (67) ON THE REPLY CARD

BURROUGHS CORPORATION'S ELECTRODATA DIVISION has published a 14-page brochure describing installations and applications of the Burroughs 205 electronic digital computer system in the oil and gas industry. Installations including those by United Gas Corporation and Northern Natural Gas Company cover such applications as system simulation, flow analysis, engineering, reservoir engineering, and accounting.

CIRCLE (68) ON THE REPLY CARD

FULL DETAILS on American Meter's two new model domestic aluminumcase meters — AL-175 and AL-250 — are now available. Both meters are light weight — 15-lb — and have a maximum working pressure of 5 psi. They have a rated capacity of 175 and 250 cu ft per hour respectively, at ½-in. wc differential.

CIRCLE (69) ON THE REPLY CARD

NEW LIGHTWEIGHT ROCK DRILL from Davey Compressor Company weighs only 42 lb; can be easily converted, without dismantling, from blower type to blast type or to wet type with manual valve. Alternate rotation speeds are also available. Overall model length is 22¾-in. with retainer.

CIRCLE (70) ON THE REPLY CARD

ADVANTAGES OF GAS AIR CONDITIONING are stressed in new film and booklet now available from Minneapolis-Honeywell. Both film and booklet, sponsored by Honeywell in cooperation with the American Gas Association, are suitable to show and distribute at cooking schools, civic and fraternal meetings, and sales meetings. The 18-minute color movie starring academy award winner Jane Darwell, takes a humorous, approach to a typical family reaction to hot weather while promoting the advantages of gas air conditioning. The 12-page colorful booklet written by Margaret Spader, nationally known home economics editor and consultant, tells how air conditioning can help families to be healthier and get more enjoyment out of everyday living, and stresses the sound investment of gas air conditioning in the home.

CIRCLE (71) ON THE REPLY CARD

FOUR PAGE DATA SHEET from Bryant Industrial Products Corporation describes the new Incino-Flame, packaged burner-blower unit that is completely piped, wired, and ready to install. Two pages of data sheet cover construction and features of Incino-Flame; the other 2 pages give installation and operating instructions. Unit can be used on incinerators, ovens, air heaters, furnaces, and miscellaneous heating applications. Features include a nozzle-mix burner that does not require refractory combustion tunnel, and a blast pilot that will not blow out. Unit is available in 2 capacity ranges — each with a minimum of 50,000, and maximums of 450,000 or 600,000 Btu per hour.

CIRCLE (72) ON THE REPLY CARD

ADVANTAGES OF USING DU-RADIANT CLUSTERS for heat processing of resins, varnishes, oils, inks, greases, chemical solutions, acids, alkalis, concentrations, polymerizations, organics, essences, and esters are described in new 12-page bulletin from Selas Corporation of America. Photographs of installations of all types, and schematics of different heating applications are given. Also, to help answer many of the other problems involved in processing liquids, space has been given to inert gas generators, floscopes, liquid separators, dehydrators, vape-sorbers and liqui-jectors.

CIRCLE (73) ON THE REPLY CARD

PROCESSING GLASS WITH GRADIATION HEATING is subject of 20-page bulletin from Selas Corporation of America. Answers to many problems on melting, annealing, fire-polishing, bending, temperating, coating, fiberizing and processing for electronics are covered in new publication. Photographs, schematics, and charts of successful installations clarify how each glass heating problem is solved.

CIRCLE (74) ON THE REPLY CARD

APPLICATIONS OF HAGAN RING BALANCE METERS are described in 8-page bulletin from Hagan Chemicals & Controls, Inc. Graphic discussions of such applications as wide range flow meter; electronic receiver; computer for measurement of net weight of solids suspended in a fluid stream; Btu measurement in a heat exchanger, and measurement of weight flow of gas undergoing density variations are included. Description of the features of the ring balance meters are each keyed to a more detailed technical catalog.

CIRCLE (75) ON THE REPLY CARD

MUELLER®

SERVICE CLAMPS

fast, permanent connections to any main

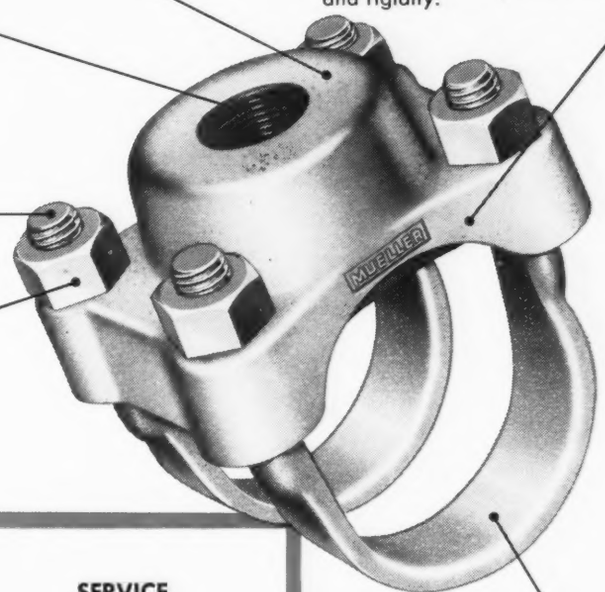
Entire body heavily galvanized for maximum resistance to corrosion. Black finish also available.

Tough, malleable iron body accurately fits contour of pipe and gives maximum strength and rigidity.

Full length threads, precision machined in thick body boss, assure solid, leak-proof connections.

Unusually large cross sectional area provides maximum strength during installation. Even the smallest clamp has a ⅝" diameter strap because this is the smallest size bolt that cannot be broken by a normal individual in normal use.

Rolled steel, cadmium plated nuts accurately machined to give solid, permanent connection without re-tightening. National Standard threads give maximum strength by assuring precise fit.



Neoprene gasket, recessed into body, is not affected by gas and gives positive, easily-made seal. Gasket is cemented in place for ease of installation.

SERVICE CLAMP

Iron Pipe thread tapping from ½" through 2".

Pipe sizes from 1" through 12".

Single or double strap type.

Heavy cadmium plating on strap and threads gives maximum resistance to corrosion. Black finish also available.

Forged steel straps, accurately curved to fit pipe, are as wide and flat as practicable to give maximum bearing and greater stability.

Flattened strap gives large contact area—increasing life of clamp by reducing effect of corrosion.

All Mueller Service Clamps now packed in labeled, corrugated cartons for ease in handling, shipping and storing.

These features are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product manufactured for the gas industry. Write for complete information.

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Appearance

No. 240

BE SURE TO SPECIFY Sprague

Please your customers with a gas meter that measures up in *looks* as well as in performance. The well-proportioned case, clean-line design, and solid construction of all Sprague Meters looks good anywhere, inside the house or outside. And it's especially important now, with outdoor installations becoming more and more popular, that your meters compliment you and the houses they serve.

You can count on Sprague Meters to *stay* looking good for years, too! They're too tough to dent or corrode, and their practical, honest design has no fadish "gimmicks" that will quickly go out of style. For appearance sake, choose the hard-case meter that's easy on the eyes — choose Sprague.

The Sprague No. 240 Meter is designed for the increased loads in domestic heating and small industrial installations. It is adaptable to both low and intermediate pressure measurement and gives outstanding service under the most exacting conditions. Like all Sprague Meters, the 240 is good looking, rugged, and famous for sustained accuracy of measurement with low maintenance costs.
Other sizes from 175 to 1,000 cu. ft. Iron Case or Aluminum Case. (Synthetic or leather diaphragms in sizes 175 & 240.)

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